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Two overclocked, custom-cooled cards battle for bragging rights PG. 76



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MAXIMUM PC

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DREAM MACHINE 2013

How we built a PC that blends retro style with cutting-edge performance



Beige is back, and badder than ever!

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SEPTEMBER 2013



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Photography by
Mark Madeo


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MAXIMUM PC

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Gordon Mah Ung

THE DREAM CONTINUES

THE FUTURE IS ABOUT THE PAST.

You might dismiss this year's Dream Machine as kitsch or perhaps a vintage play designed to appeal to skinny-jeaned hipsters looking to run some ironic computing so they can impress their friends on their retro MySpace accounts, but you'd be wrong.

This year's Dream Machine is here to remind you, to remind us, what it used to be like before the world got so gray on just exactly "what a PC is."

There's no doubt that anyone who looks at this year's Dream Machine will immediately know what it is: a big-ass, badass, and beige-ass PC.

How big? It takes two interns to move it and one editor to spot in case someone crumbles under its weight.

How beige is it? It's actually vintage Packard Bell beige, but painted with the care and precision typically given to a perfectly restored classic muscle car.

How badass is it? It's so bad it has its own theme song sung by Isaac Hayes. Hell, our first run in 3DMark broke into the Top 10 Hall of Fame and subsequent runs actually destroyed a power strip and caused a nearby computer to crash. The crash likely came from the excessive power consumption but we're not ruling out the possibility that it crashed out of fear or performance envy, either.

That's what the mission of Dream Machine has always been: an annual celebration of as much raw, wanton Pure PC Power as anyone can cram into one PC. It's as true today as it was 17 years ago when we first established the Dream Machine tradition.

While naysayers will continue to say that the PC is dead, or that we're well into the "post PC" era (whatever that means), we don't accept it. Make no mistake though, the PC faces the greatest threat it has ever faced, but that doesn't mean you give up. We have faith that the PC's strength in open architectures, adaptability, freedom to install the OS or drivers you want, and power beyond what any tablet or phone could ever dream about will once again see the PC through.

Until then, we'll keep benchmarking, we'll keep building, and we'll keep clinging to our PCs until our battle is over.



Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

AMD Snags GPU Duties in Next-Gen Consoles

What effect, if any, will it have on PC Gamers?

NOW THAT THE dust has settled and we know the next-gen consoles from Sony and Microsoft will be running AMD hardware, PC gamers are naturally staring at their Nvidia GPUs and Intel CPUs and wondering what the future holds. Will developers stop developing games that are optimized for Nvidia hardware, since their end goal is supposedly to have them run like buttah on an AMD-powered console? Should we all go out and buy an AMD GPU now just so we can run the same "target" hardware the game developers are using? And finally, what does the move to an x86 CPU architecture herald for desk jockeys like ourselves?

First of all, you will not be able to find a single person, analyst or otherwise, who will tell you this development means anything bad for the PC. In fact, it's exactly the opposite. Remember all that "the PC is dead" jibber jabber? Well now that both next-gen consoles are essentially PCs, it cements the PC's role as the go-to platform for game development. The concept we used to refer to as "porting a game from the console to the PC" is finally vanquished, as developers will no longer have to deal with the hassle of porting from a PowerPC code base to x86. Literally every new game made in the future will be developed on a PC, for the PC. Also, since the next-gen consoles offer a huge leap in performance compared to current-gen, and a lot of developers target this "lowest common denominator," the bar is now much higher, meaning we should see an improvement in technology with the next-gen of PC gaming titles since they will be using DirectX 11 as a baseline. No longer will a developer leave a feature on the editing room floor, so to speak, because the consoles don't support it.

Finally, we come to the impact of having AMD hardware in each console sold for the next five-plus years, and what that means for both game developers and Nvidia lovers. The short answer is that it probably won't negatively impact anyone, though obviously AMD and Nvidia have differing opinions on this matter. "The consoles are really the target for a lot of the game developers; if it's a Radeon heart powering that console, like the PS4 or Xbox One, that means these game devs are going to be designing their games, designing their features, and really optimizing for that Radeon heart," said AMD's Devon Nekechuk in an interview with our sister magazine *PC Gamer*, at the launch of the Radeon HD 7990. Not surprisingly, Nvidia disagrees. "Nothing is going to change," Nvidia PR manager Bryan Del Rizzo told *Maximum PC*. "Games have always been developed on PCs and then "ported" or scaled down for the consoles. That model will never change, as the PC is their preferred development platform and the tools they use are cross-platform." Del Rizzo added, "GeForce GPUs will continue to deliver the best gaming on the PC regardless of what hardware is in the console, just as is the case today."

One thing both manufacturers can agree on is that with both next-gen consoles running eight-core CPU/GPUs, we will finally see games being multicore-aware, which will benefit all PC users regardless of whether they are running AMD or Intel CPUs.

–Josh Norem



AMD claims its dominance of the next-gen consoles will result in game development targeting its hardware, but Nvidia says nothing will change.



Amazon Opens 3D-Printing Store

Online retailer Amazon started a dedicated section for 3D printers on its website in mid-June, in its Industrial & Scientific department, where things like lab equipment and janitorial supplies are usually categorized. Up until this point, such printers usually have been available only directly from the manufacturer. Prices have also come down to around $1,000, which is what a laser printer would cost about a decade ago. This type of printer can create three-dimensional objects from certain types of plastic or resin, while factory-grade 3D printers can create objects from a variety of metal alloys. **–TM**

Broadwell Delayed to 2015?

Roadmaps leaked in June show that Intel's Ivy Bridge-E is slated to ship in the third quarter of this year, followed by refreshed Haswell parts in 2014. With Broadwell nowhere to be found on any of the slides, this indicates that it won't come out until 2015 at the earliest.

The main benefit of Broadwell, which is a "tick" in Intel's "tick-tock" upgrade cycle, is lower power consumption and higher performance per watt yet again. That's not very exciting on the desktop, so instead it appears that Intel is more focused on tweaking Haswell next year. Delaying Broadwell to 2015 would also give Haswell-E a chance to shine without being overshadowed when it launches late next year. **–PL**



No Port of EA's Ignite Engine

Game publisher Electronic Arts said in June that titles using its Ignite graphics engine would not be getting ported to the PC because of perceived technical limitations, according to gaming website Polygon. Before you break out the torches and pitchforks, there actually is a precedent for this. EA Sports executive vice president Andrew Wilson told the website that earlier releases of its FIFA soccer games on the PlayStation 3 and Xbox 360 had more advanced graphics because the average PC at the time was not beefy enough. Rather than developing two different engines for the same game, EA is opting to stick to consoles for now, where the bulk of game sales are usually found. **–TM**



Tom Halfhill
Fast Forward

YOUR DATA IS VALUABLE ORE

POOR EDWARD SNOWDEN. The former NSA subcontractor has sacrificed his career to expose US government surveillance programs that were revealed years ago. Except for minor details, data-mining operations like "PRISM" were outed in 2006, and have been underway since at least 2003. Newspapers may be dinosaurs, but they beat the Internet to this story by seven years.

Outside Washington, D.C., perhaps the least surprised people were in Silicon Valley, where companies design much of the technology that enables data mining on this vast scale. In 2006, a whistle-blower revealed a secret room in a San Francisco AT&T central office where mysterious equipment had its own intravenous connection to the network. It had existed for three years. Also in 2006, *USA Today* detailed the data-mining operation we know today as Prism.

That same year, I wrote about a prototype processor with 4,096 cores. It was designed for commercial video processing, but an early adopter was In-Q-Tel, a government-sponsored venture capital fund that promotes research and development for the CIA. Nobody would talk about the CIA's application, but I can make some good guesses.

Keep in mind that intelligence agencies needn't collect and store the data they search. Private sector companies already do that. Those companies sell the data to each other and mine it for money. The government mines it for security threats. Both types of miners get lots of help from specialized processors designed for networking.

We absolutely need these processors to scan Internet traffic for malware and to speed network packets to their destinations. That these chips can also be used for mass surveillance is either a bonus or a menace, depending on your viewpoint. But the technology is here to stay, because big data has become a profitable commodity for the private sector and an irresistible resource for cops and spooks.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Thomas McDonald
Game Theory

MICROSOFT'S MISTAKE

LET'S BEGIN with the most amusing part of the widely derided launch of the Xbox One: At least some of the game demos for the new system were run on a PC using Windows 7 and an Nvidia graphics card. See! Even Microsoft doesn't use Windows 8 for gaming!

It's not at all unusual for new consoles or games to run on PCs, but if only Microsoft really understood what that meant. At the heart of the new system are eight x86-64 cores, a GPU based on the AMD GCN with 768 cores total, 8GB of DDR3 RAM (3GB for overhead such as OS, and the remaining 5GB for games and operations), a 500GB hard drive, a Blu-ray drive, and integrated Wi-Fi and Kinect.

No PC gamer worth his box would turn up his nose at that kind of firepower for $500. It may not be a pure muscle system, but it's more power than you usually can get for the price.

It's even running a kernel with the same network, file, and graphic support used in the Windows family, which raises the possibility of cross-platform portability. The potential for this remains to be seen, particularly since Windows apps can't be brought straight into XB1 without significant adaptation.

My question is: why?

With the PC market wobbling, and Microsoft heavily invested in that market, why wasn't XB1 a radical PC/console hybrid that allowed for full interoperability?

I believe that Valve's Steam Box has the potential to be a console killer, while still enabling the multimedia ambitions that are Microsoft's real focus right now. Valve's anti-Windows, open-system box is a shot aimed right at the sweet spot of the Xbox/PC demographic, and if it's priced and marketed correctly, it could change the fortunes of PC gaming.

Microsoft could easily have taken that shot, and the buzz out of E3 would have buried Sony for good. My question is: Why didn't they?

Thomas L. McDonald is Editor-at-Large of Games Magazine.

MS Opens Best Buy Mini-Stores

Best Buy is no longer playing favorites with Apple. The end of that monogamous relationship began when Samsung started installing "Experience Shops" inside the electronics chain, and now Best Buy is giving Microsoft the same opportunity to sell its wares by opening up Windows Stores at over 600 of its locations this summer. The store-within-a-store format will appear in 500 Best Buy locations across the United States, 100 Best Buy and Future Shop locations in Canada, and will entail the hiring of 1,200 Microsoft-trained Best Buy sales associates.

The integrated Windows Stores will range in size from 1,500 to 2,200 square feet. Consumers will be able to play with Windows tablets and PCs, Windows phones, MS Office, the Xbox console, and more. **–PL**

Nvidia's GeForce GTX 760 Debuts

This month, Nvidia released the GTX 760—a GPU it says will be the last 700 series board until the end of 2013. Based on the same GK104 GPU found in the GTX 680, 670, and 660 Ti, the GTX 760 slides in below the GTX 770 as the company's $250 mainstream board, and offers performance on par with the formerly $400 GTX 670 while offering quieter operation, thanks to Nvidia's GPU Boost 2.0 technology. It will be available in both 2GB and 4GB configs, and overclocked versions with fancy coolers will be available, as well. For full benchmarks visit http://bit.ly/760gtx. **–JN**



Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS

JOHN MCAFEE
Antivirus tycoon posts hilarious "how to uninstall McAfee" video. Kudos, sir.

RAZER
Releases free 7.1 surround sound add-on for any headset. Thanks!

MOZILLA
Prepares to make "Do not track" default setting for Firefox, advertisers be damned.

THE PC
Analysts predict PC sales will trounce tablet sales, again, in 2014. Guess it isn't dead yet.

TRAGEDIES

MICROSOFT
Its Xbox DRM U-turn led many to rename it Xbox 180.

ADOBE
Its "all cloud" subscription service launches, pisses off entire world.

NVIDIA
Forced to drop Shield's price $50 after customer pushback.

INTEL
Leaked roadmap indicates 14nm Broadwell delayed until 2015. Hope you like Haswell.



Quinn Norton Byte Rights

THE DISTRIBUTED DOUCHEBAG ATTACK

LAW AND TECHNOLOGY can interact in funny ways. Take the Digital Millennium Copyright Act, which allows for those hosting material on the Internet to avoid liability for copyright infringement if they comply with requests to take down copyrighted material quickly. It motivates companies hosting material, like YouTube or Flickr, to streamline the process. Increasingly, rights holders are automating their side too, potentially leaving two scripts talking to each other to determine the destiny of media. But plenty of requests that come through aren't valid, or are aimed at legal content. Chillingeffects.org maintains a database of requests, sensible and not, including one from 2012 where HBO attempted to take down access to its own site.

Ah, scripts. This is where it gets fun—a recipe for legal chaos.

The first ingredient is a Markov chain. This is a mathematical method to build elements out of a random but conditional process. They're good for building plausible text when properly seeded with something like the Chilling Effects database, with its thousands of legal letters. Combined with a few reasonable templates, an offshore server, and a bit of web crawling, an ambitiously foolish programmer could DMCA takedown All The Things.

The burden to prove the legality of the material is on the person who uploaded it, who can also file a counter-notice to the takedown request. This part requires a human, meaning it doesn't scale very well, at least not compared to our litigious (though bluffing) automated systems.

It's hard to predict how many would get through, but with enough automation, such legalistic spam could still put a dent in human expression. It's an attack built into the law, enabled by technology. I call it the Distributed Douchebag Attack, and while it's definitely inadvisable, possibly illegal, and plainly reprehensible, it's a reminder that law can be hacked, too.

Quinn Norton writes about copyright for Wired News and other publications.

Windows 8.1... Finally

You could hear the screams of desktop users across the globe as the agony of Windows 8 set in for us mortals using keyboards and mice. Faced with Win8's touch-oriented interface, desktop users were forced into the new, unfamiliar territory of fishing for hot corners and clicking on enormous tiles.

Windows 8.1 is Microsoft's update to its touch-oriented OS and contains features specifically serving desktop users. At the top of the list is the option to disable those pesky hot corners and to boot directly to your desktop, bypassing the Windows 8 Start screen altogether. For users who use the blocky Start screen, you can now set the background to match your desktop. And if you choose to use Windows 8 Apps, you can now run and resize up to four different apps at a time.

While this might read as a list of features that should have shipped last year when Windows 8 first launched, there are new features in Windows 8.1 that specifically benefit gamers and power users. Gamers will benefit from Microsoft's implementation of Tiled Resources in DX11.1, a feature that allows your computer to render scenes larger than your GPU's memory. Power users will be happy to hear that Microsoft has also included native drivers for 3D printers, Miracast screencast technology, and fingerprint recognition for external devices.

Despite all the additional content and features, the 8.1 update will cost nothing. At press time, users of Windows 8 could download a 2GB file to install a preview version. The final version arrives in the fall. **–JR**



Google, Twitter Skip FISA Offer

Facebook and Microsoft accepted an offer by the government to adjust their surveillance transparency, but Google and Twitter rejected it, claiming unacceptable conditions. The current offer forces companies who wish to disclose FISA requests to lump in those coming from the NSA with those of US local, state, and federal law enforcement agencies. This restriction makes it impossible to know who gets the info, and it's further complicated by another rule that forces them to only report requests in clusters of 1,000 people. Google says lumping FISA and criminal requests together is a step back for transparency. Twitter's legal director Benjamin Lee sides with the search giant. **–JK**

Tattoos, Pills Could Replace Passwords

At the All Things Digital conference in late May, Motorola executive Regina Dugan showed off a temporary tattoo intended to be "read" by a computing device, instead of the user entering a password. She said that the tattoo could be scanned like a UPC code and could be worn for a week. It contains an antenna and sensors, however, so it's a little more advanced. It was designed by a company named MC10 that specializes in "wearable" computing. If you don't want your password to be visible, Motorola is also working on a pill that would emit a signal recognized by the device you want to access. **–TM**

THE LIST

7 MOST PROMISING GAMES OF E3



7 BATTLEFIELD 4

New naval vehicles, the return of the Commander Mode, and vastly improved destructibility: What's not to love?



6 THE ELDER SCROLLS ONLINE

We know there's no shortage of MMOs, but if there's one franchise that's begging to go online, it's The Elder Scrolls series.



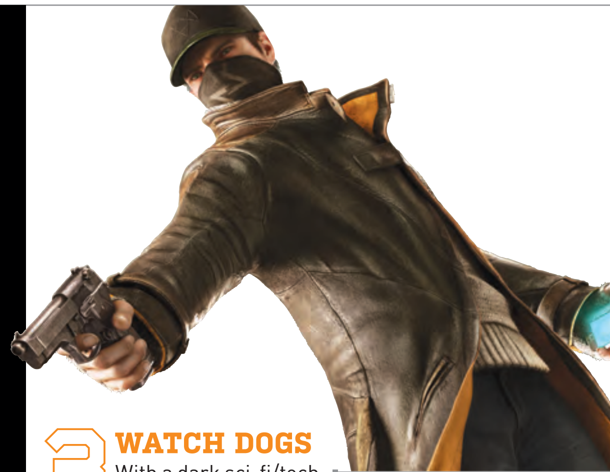
5 THIEF

From out of the shadows comes a welcome reboot of one of our favorite stealth franchises.



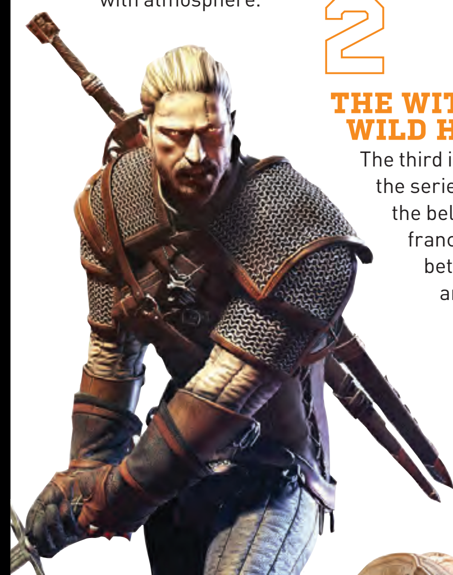
4 ARMA 3

While ARMA 3 is set in the near future, expect it to be one of the most realistic tactical shooters ever.



3 WATCH DOGS

With a dark sci-fi/technological story that's eerily relevant today, Watch Dogs oozes with atmosphere.



2 THE WITCHER 3: WILD HUNT

The third installment of the series concludes the beloved RPG franchise with better graphics and a massive open world.



1 TITANFALL

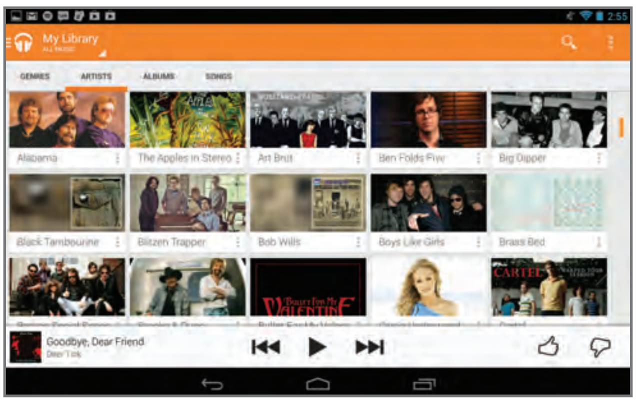
What do you get when you combine the original creators of Call of Duty and Mechs? The talk of E3!

HEAD TO

BY PAUL LILLY

Google Play Music All Access vs. Spotify

Rocky Marciano never lost a bout during his professional career, and so far in our own sanctioned cage fights, neither has Spotify. The spunky streaming music service handily dispatched Rdio when we tossed the two in a ring two years ago, and more recently, Xbox Music took a beating, losing four out of five rounds. Google, however, has come out swinging with a promising music service of its own. Will there finally be a new champ?



Though it's the new kid on the block, Google has amassed an army of tunes ranging from mainstream artists to obscure bands.

Round 1: Music Library

Let's cut right to the chase—the real reason to consider subscribing to a streaming music service is for the music catalog. Size matters, and the bigger and more robust the selection of tunes, the better. At last count, Spotify was sitting pretty with around 20 million tracks and deals with all three major music labels (Universal, Sony, and Warner). Google also brought the big three on board and boasts 18 million–plus songs.

With both services having lured the big fish to their respective ponds and both offering a similar number of tunes, we directed our attention to indie artists and obscure bands to see if either had an advantage over the other. It turns out they don't. Artists and bands like Ted Hawkins, Psychostick, and Apples in Stereo lie in wait, as do indie favorites like The National and Passion Pit. For all intents and purposes, this category's a draw.

Winner: Tie

Round 2: Pricing

Google Play Music All Access (an unnecessarily long and clumsy name for a subscription service, by the way) burst into the streaming scene with an introductory price of $8 per month for anyone who signed up for a free trial by June 30, 2013. That deal will be long gone by the time you read this, so if you didn't hop on board, the price is now $10 per month. What that gets you is unlimited ad-free listening to Google's entire music catalog along with a Pandora-like radio service with unlimited skips.

Spotify's Premium tier also runs $10 per month, but it's not the only option available. If you just want to access music on your PC without the ability to download tunes for offline listening, the price is cut in half. Alternately, you can get on-demand access to songs for free on your PC if you're willing to tolerate ads.

Winner: Spotify

HEAD



Spotify's desktop client still has a tendency to feel cluttered, though it's relatively easy to navigate.

Round 3: Platform and Device Support

Spotify launched four years ago (two years ago in the United States) and is now available on just about every platform you can think of. Surprisingly, in-browser listening is a feature that was only recently added, but it's there, along with support for Android (including Kindle devices), iOS, Windows Phone, BlackBerry (select devices), Symbian (also on select Nokia phones), PC, and Mac. In stark contrast, Google's newly minted streaming music service is only available on Android, though an iOS app is in the works and may be available to download by the time you read this. While casting a net over Android and iOS catches the majority of mobile users, it won't come as any consolation to Windows Phone 7/8 or BlackBerry users. We suspect it's only a matter of time before Google invites more mobile users to the party, but for now, this is another round that belongs to Spotify.

Winner: Spotify

Round 4: Audio Quality

Today's mobile devices aren't equipped with speakers that would delight an audiophile, but they're not total garbage, either. Audio quality matters, especially if you're plugging a high-end headset or earphones into your phone's audio jack, so it's up to Google and Spotify to serve up streams that don't sound like they're traveling across string from one tin can to another.

Fortunately, both belt out tunes at up to 320Kb/s. By default, Spotify assumes you're more concerned with your data cap than with the highest quality stream available, so you'll have to go into Settings to change things. The Low setting equates to 96Kb/s, High translates to 160Kb/s, and Extreme quality is 320Kb/s. Google doesn't offer as much fine-grain control and instead chooses a bitrate based on your Internet connection, though you can insist on only receiving 320Kb/s streams regardless of available bandwidth.

Winner: Tie

Round 5: Interface

Spotify's desktop application is a far cry from a fine piece of art, and as we've lamented in the past, it can feel cluttered at times. The latest version, which still hasn't reached 1.0, is a slight improvement from the last time we examined it, but it still lacks the modern UI feel with larger tiles that's becoming so prominent. The mobile app, however, is less busy and generally much easier to navigate. Even so, Google's implementation is a bit slicker overall. Swiping from the left brings up a menu giving quick access to things like your library, playlists, and the radio feature. Google also takes advantage of tiles at every turn and it just feels like a more modern platform than Spotify. We also like that you can add artists to your library, which Google then uses to make recommendations based on who and what you like to listen to.

Winner: Google Play Music All Access

And the Winner Is...

Google Play Music All Access is a slick-looking service with a lot of promise and eventually it's going to give the competition a serious run for its money, but today is not that day. For now, **Spotify** remains the undefeated champ, a sure sign of a mature contender that knows the ropes. Most notably, Spotify recognizes the importance of supporting multiple mobile platforms, and it doesn't hurt to offer multiple pricing tiers, either.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> Discrete vs. Haswell IG
> PhysX Cards
> Upgrading Laptop Screens

New Integrated vs. Old Discrete

I'm an AMD guy who opened his wallet to purchase a Haswell Core i7-4770K to run on an Asus Z87 Deluxe mother-board. I'm not a big gamer and can't justify yet more money for the latest graphics. Just how fast is the Haswell integrated GPU and how does it rank relative to my current Sapphire 5850 1GB? I also have a second Sapphire 5850 in another system that I could rob for CrossFire. Would that be the best interim course, or should I use the Haswell graphics?

—Tim Averett

THE DOCTOR RESPONDS: Tim, the Intel HD 4600 graphics in that 4770K are pretty nice for integrated—see our review in the August 2013 issue—but the Radeon HD 5850 is still a much faster GPU, despite being nearly four years old. It's hard to get exact numbers because our benchmarks have changed so much between the time we tested the HD 5850 and the Intel HD 4600, but we gave it a shot anyway. Over on 3DMark.com, you can filter benchmark results by CPU and GPU. We found one result for an i7-4770K with a Radeon HD 5850, with a score of 2,893 3DMarks. A 4770K with its integrated graphics scored a mere 1,154 despite having access to twice as much system RAM. You should see at least double the performance, in most games, from that 5850 than you would from integrated. And, of course, if you added the second card, you'd roughly double performance again.

VRAM: What's It Matter?

I'm planning on upgrading my current rig, which has an Intel Core 2 Quad Q9550, 4GB RAM, 500GB SATA III HDD, and an MSI N8600GTS with 512MB of VRAM. I know it's old, but at the moment I don't have the budget for a whole new rig. I was looking at the MSI R7870. Is this an OK option, given that I have PCIe 2.0? Also, I've noticed that some low-end cards such as the MSI N630GT come in variations of 2GB and 4GB VRAM. What role does the VRAM play in GPU performance? When I upgrade my rig I would like to keep the HD 7870 and just pop another in CrossFire. Is it worth it?

—Christiaan Karsten

THE DOCTOR RESPONDS: The 7870 would be a great upgrade for your machine, and you will see a huge performance improvement in all the games you play. Regarding video memory, more memory mostly helps you run at higher resolutions, but with that card you will be running 1080p and the 7870 will be totally adequate for cranking all settings to max in most games. You would only need 4GB if you were running super-high resolutions or multiple panels. PCIe 2.0 is fine for even the burliest GPUs, and we generally don't recommend upgrading just for PCIe 3.0. Your 2.83GHz "Yorkfield" CPU is a tad dated but probably fine since your budget is limited.

We Think He Meant Linux

Can you recommend a good linus [sic] software or did Microsoft buy you?

—Johannes Vikerns

THE DOCTOR RESPONDS: If Microsoft bought us we'd have more editors and more access. Try Ubuntu or Linux Mint.

Let's Get PhysXal

I recently got an Asus computer that came with a GeForce GTX 650 GPU. Knowing it's a lower-end GPU, I started looking into a second or replacement GPU. I was hoping to be able to use the 650 as well as a better card, but found an interesting fact, and an issue. The 650 is actually a decent card, and can handle most things I do better than my friends' "better" systems, which are a bit older. My second x16 slot is right at the bottom of my case, so a second card can only be single-slot, and the 600/700 series GPUs are all two-slot cards.

Can I use a card like the GTX 640 for PhysX in my system? I need a better PSU in any case, and am planning ahead a bit. I also do Folding@Home, so I'm looking at being able to use a bit more horsepower for that.

—Kevin Berger

THE DOCTOR RESPONDS: You're right that the 650 is still a pretty decent card for gaming. If all you need is a PhysX card, you don't need a GT 640 in that second slot—a single-slot GT 520 or 620 is under $50 and will be more than enough. According to Nvidia, you can use any "GeForce 8-series or later GPU with a minimum of 32 cores and a minimum of 256MB dedicated graphics memory," though they recommend 512MB if

↘ submit your questions to: doctor@maximumpc.com

you can get it. So, you might be able to find an older card for free (or close to it) and use that for PhysX. Keep in mind, adding a second card for PhysX won't help you at all in games that don't support PhysX.

Asset Offline

Whenever I log in to Steam my friends always see me as Offline. How can I fix this?

—Matthew Toro

THE DOCTOR RESPONDS: Fortunately, this should be a simple fix. Go to your Friends menu. There's a drop-down arrow to the right of your avatar and display name that lets you set your state. You're probably set to appear as Offline. Change it to Online and you should be ready for jolly cooperation.

Drive Not Recognized

I'm having trouble installing Windows XP Professional via USB on a netbook I'm trying to fix up. I've tried multiple Windows USB Setup programs (WinSetupFromUSB, WinSetupFromUSB beta, Win2Flash, and others I can't remember), but all have ended the same way: None can detect the internal SATA drive.

I set the hard drive to AHCI mode, downloaded the correct F6 drivers, and put the files on a USB drive that I formatted as a super floppy, but it still doesn't find the hard drive. I have also read online that switching from AHCI to IDE mode helped some people, but no luck with that either.

—Blake C.

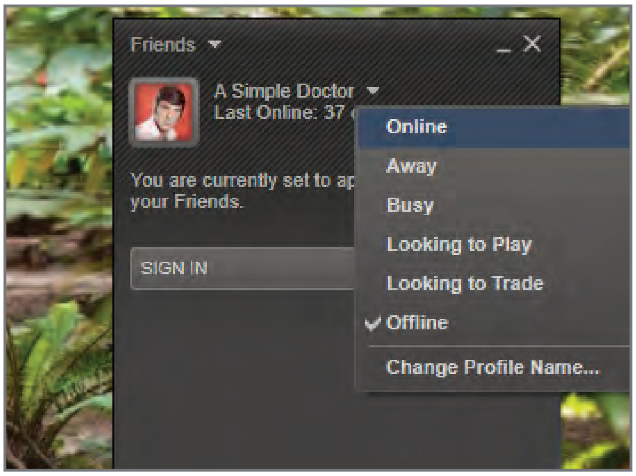
THE DOCTOR RESPONDS: Try using a different bootable USB, like a Knoppix or Ubuntu Live disc, to see if the problem is Windows-specific. If the drive still isn't recognized, try taking it out of the netbook and connecting it to a different computer. If it doesn't work there either, your drive is bad. If it works there, there's something wrong with your netbook—probably the SATA connection. In that case, it might be time to throw in the towel—even if you get the netbook working, it'll still be a netbook.

Upgrading a Laptop Screen

I have an HP Pavilion dv6-6117dx laptop, with a 15.6-inch LCD (1366x768). The viewing angles and colors are terrible. Can you please tell me where or how I can purchase a new/used screen that will fit my laptop? I don't want the same HP replacement, but a new or used screen that has great resolution and viewing angles. I just need to know what to order, so I don't get the same bad screen, thanks.

—Brian

THE DOCTOR RESPONDS: Usually you'd be out of luck, but The Doc has actually come across a forum thread that's right up your alley. Jackharvest at Notebook-review.com found a way to mod an aftermarket 1080p screen into his dv6 and helpfully provides part numbers and detailed instructions at http://bit.ly/13SHBWj. As always, don't come running to us (or Jackharvest) if you break something.



If your friends can't see you on Steam, make sure you're not set to appear offline.

[SECOND OPINION]

Gremlin Bashers

Recently, I experienced the same "display driver has stopped responding" error (Doctor, July 2013) on a Gigabyte B75 board with a Gigabyte GTX 560. I tried all of the solutions you touched on in your article and none worked. The problem only occurred after installing .NET Framework 4.0 with Nvidia video drivers; it ran fine with .NET 4.0 and Microsoft's native drivers. Game rendering, DXVA, and other GPU-intensive tasks ran fine, but the error would occur every time I opened Chrome, did anything with Flash, or let the PC idle to a powered-down monitor, sleep, or hibernate state.

After countless hours browsing through forums I did find a solution that worked for me. Gigabyte and Asus have several advanced CPU-related power-saving features that you can enable and disable through the BIOS/UEFI.

In Advanced Frequency Settings\Advanced CPU Core Features I disabled: CPU Enhanced Half (C1E), C3/C6 State Support, and CPU EIST Function.

This may cause the CPU to not throttle down as much and the PC may consume more power, but the "display driver has stopped responding" problems completely went away. The features may be in a different part of the EFI on an Asus board, but they should still be accessible.

—Steve Spring

[THIRD OPINION]

Fixed by a Nip and Tuck

About two years ago, I would frequently get that same error: "Display driver stopped responding and has recovered. Display driver Nvidia Windows Kernel Mode Driver, Version xxx.xx stopped responding" (Doctor, July 2013). It had no correlation to anything I was doing at the time. I tried a bunch of things to fix it, to no avail. Then a friend suggested that it sounded like the video card wasn't seated fully. I pulled the card and reseated it the next time it threw the error and that fixed it for maybe a month.

When it started doing it again, I pulled the card and took a good look at the PCIe slot and the case (Coolermaster ACTS 840) and noticed that the I/O panel portion of the motherboard tray looked like it was bowed outward a bit. I pushed on it till it was straight, reseated the card, and the error hasn't recurred since.

—Craig Megibow



Don't let the vintage look fool you. Though the DM's exterior is a homage to PCs of yesteryear, the interior is pure liquid-cooled, benchmark-busting badassery.

back to the future

Dream Machine 2013 pays homage to the PC's early days while being uncompromisingly cutting-edge

BY THE MAXIMUM PC STAFF

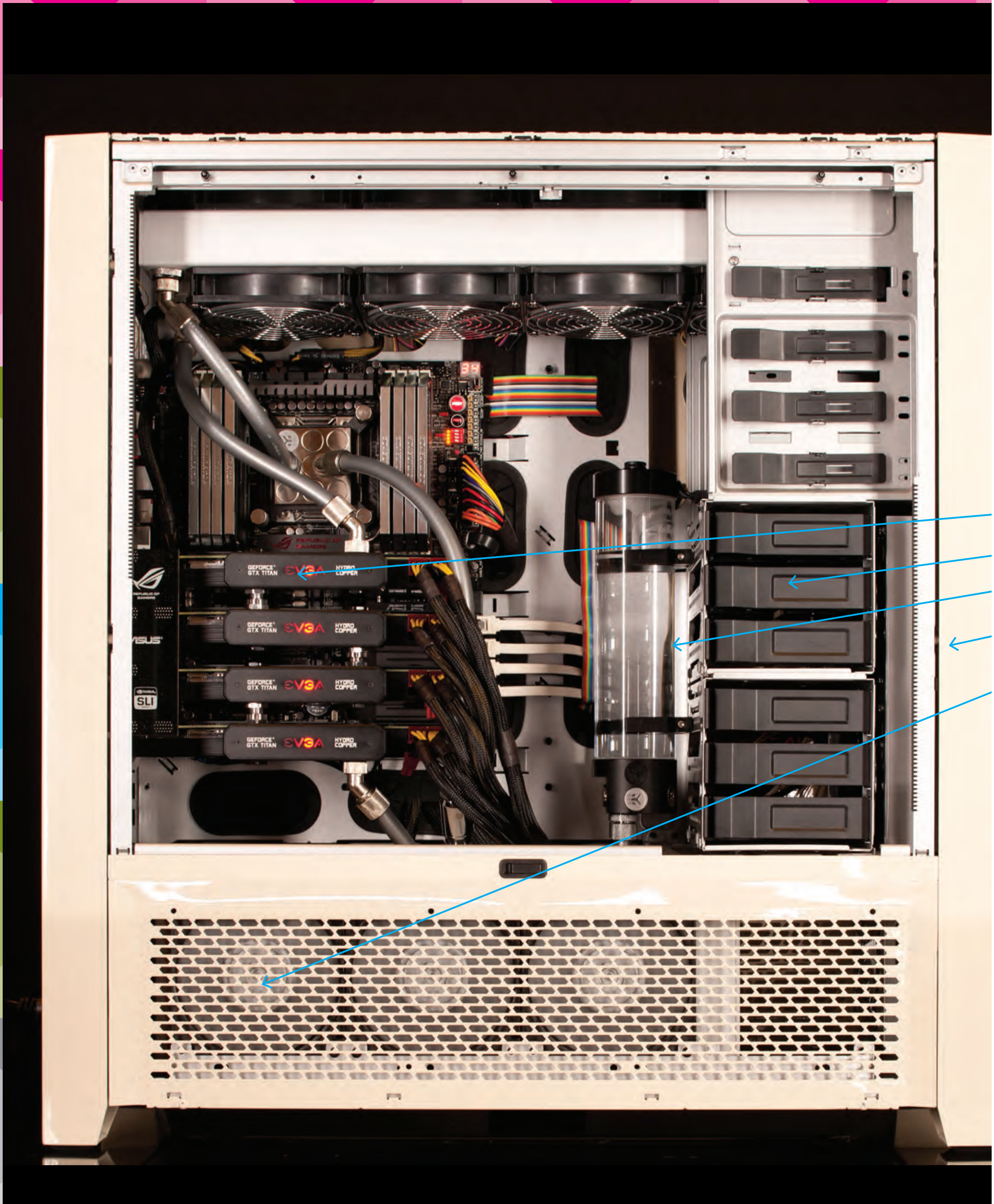
There's an old saying that we stand on the shoulders of our predecessors, because without them, we wouldn't be where we are today. Sure, sometimes you may want to throw the CPU out with the liquid-cooling water, and shrink everything into a proprietary PC shaped like a garbage can, but that pays absolutely no respect to our past.

Rather than pretend to be with the cool kids in some chic, brushed-aluminum chassis, or lie our asses off that a 2-watt CPU/GPU is something to crow about, this year's Dream Machine is an audacious tribute to all that has gone before it.

So, here's to manually jumpering IRQs and clipping single-sided floppies so you can use the other side. Here's to ISA, VL-BUS, and PCI. Here's to the glorious sound of a floppy head stepper motor, the shriek of a dot matrix printer, and the clunk of a buckling spring keyboard built with more metal than today's laptops.

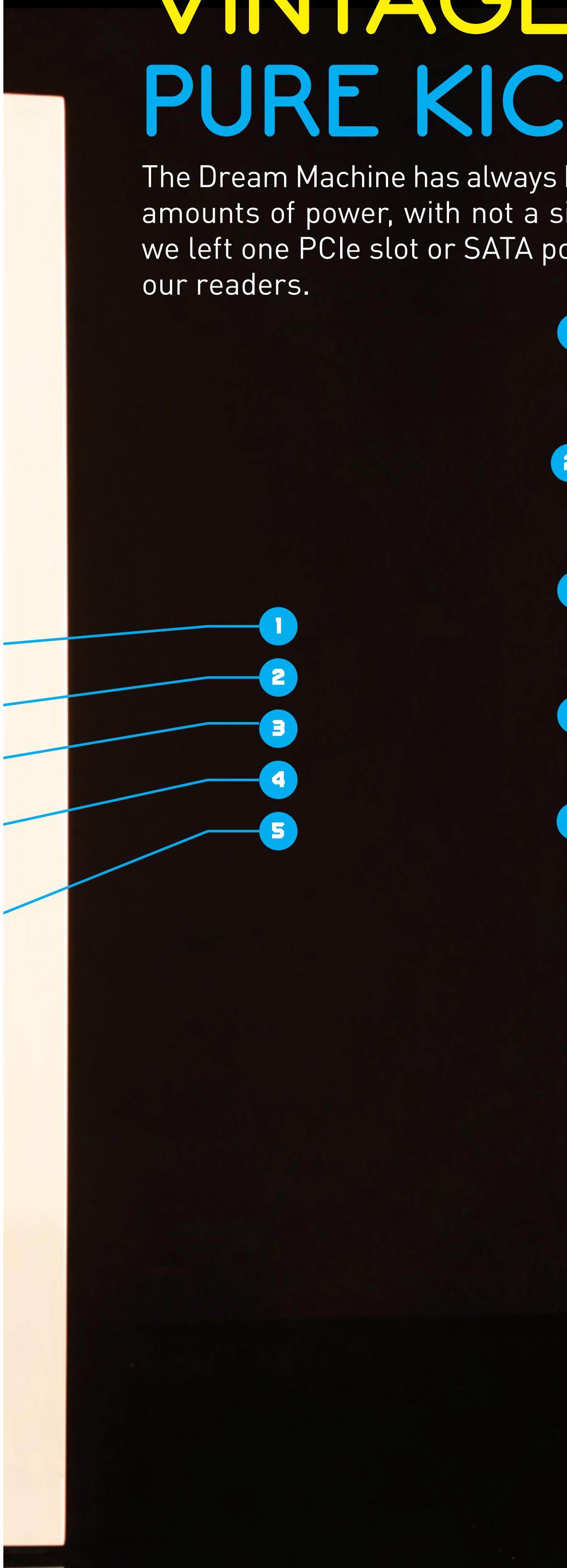
And here's to beige. Oh, wonderful IBM beige, Compaq beige, Dell beige, and hell, even Apple beige. No two parts ever matched but no one cared.

Today, we embrace the beige and all that it stands for while celebrating the very best parts that modern computing has to offer. Turn the page to learn how we built this year's über rig!


GEFORCE GTX TITAN
EVGA
HYDRO COPPER
SLI

VINTAGE OUTSIDE, PURE KICK-ASS INSIDE

The Dream Machine has always been about one thing and one thing only—absolutely ridiculous amounts of power, with not a single ounce of performance left on the editing room floor. If we left one PCIe slot or SATA port unused, it would be the equivalent of a hate crime against our readers.



1 Four-Play
The only thing better than Titan SLI is four-way Titan SLI. These babies are so fast that we were able to crack into the Top 10 3DMark Hall of Fame, no problem.

2 Hybrid This Drive
We used four SSDs and three HDDs to achieve a voluminous 15TB of storage in Dream Machine 2013. So, for all who think the hard drive is dead: It ain't.

3 Cool and Collected
With 17 fans and two massive radiators, the temps on the overclocked CPU and GPUs rarely ever moved. Hell, the temps were so low, we thought the utilities were reading them wrong.

4 Think of It as the 900B
The Corsair 900D looks like it offers excessive space—until you actually put all your hardware inside of it. Then it's actually a pretty tight fit.

5 Absolute Power
Behind the radiator lies the LEPA G1600-MA PSU, among the most powerful single PSUs on the market and, believe it or not, we needed every single watt this sucker could produce to run this year's Dream Machine.

SPECIFICATIONS

	MAKE/MODEL	PRICE
CPU	Intel Core i7-3970X	$1,000
Mobo	Asus Rampage IV Extreme	$430
RAM	64GB Corsair Dominator Platinum	$1,200
GPU	4x EVGA GeForce GTX Titan Hydro Copper	$4,680
SSD	2x Samsung 840 Pro	$1,000
SSD	2x Crucial M500	$1,200
HDD	3x WD Caviar Black	$900
ODD	Pioneer BDR-208DBK	$70
Cooling	Custom liquid cooling	$1,000
PSU	LEPA G1600-MA	$330
Case	Corsair 900D	$350
Paint	Smooth Creations	$400
OS	Windows 8 Professional	$100
Monitor	Asus PQ321	$3,800
Mouse	SteelSeries Sensei	$75
Keyboard	IBM Model M	$50
TOTAL		**$16,585**

CPU
INTEL CORE I7-3970X



Intel's new wunderchip Haswell is here with super-low power consumption and fancy 22nm transistors, which today's tablets might love, but sometimes there's simply no replacement for displacement.

That's what the top-dog hexa-core Core i7-3970X gives us with its 12 threads of computing might that chew through 3D modeling or video rendering in a way no quad-core could ever dream of doing. Last year's foray into Xeon territory also taught us that not having the option of overclocking hurt us against those pesky quad-core parts in some tasks.

With our massive liquid-cooling setup, we were able to easily push our 3.5GHz Core i7-3970X to 5GHz all day. Six cores buzzing along at 5GHz with Hyper-Threading gives us a great balance of core count and frequency. Enough that Dream Machine has the gusto to compete with newer quad-core chips in workloads that can't exploit all 12 threads.

The best part of going with LGA2011 is that we'll get a CPU upgrade in a few months when Intel finally releases Ivy Bridge-E.



Motherboard
ASUS RAMPAGE IV EXTREME

If all we cared about was color scheme, we'd have tapped the Rampage IV Extreme's little brother, the X79 Sabertooth, whose brown-and-black stylings would have nicely matched our beige case. But our needs demand more than the Sabertooth and most "regular" X79 motherboards can provide, so we reached for Asus's well-respected Rampage IV Extreme board. The board is aimed at the overclocking enthusiasts who like to crank their CPUs to low Earth orbit using liquid nitrogen or liquid helium, so for our OC, it was more than enough. Even better, the R4E is one of a handful of X79 boards rated to run four-way SLI.

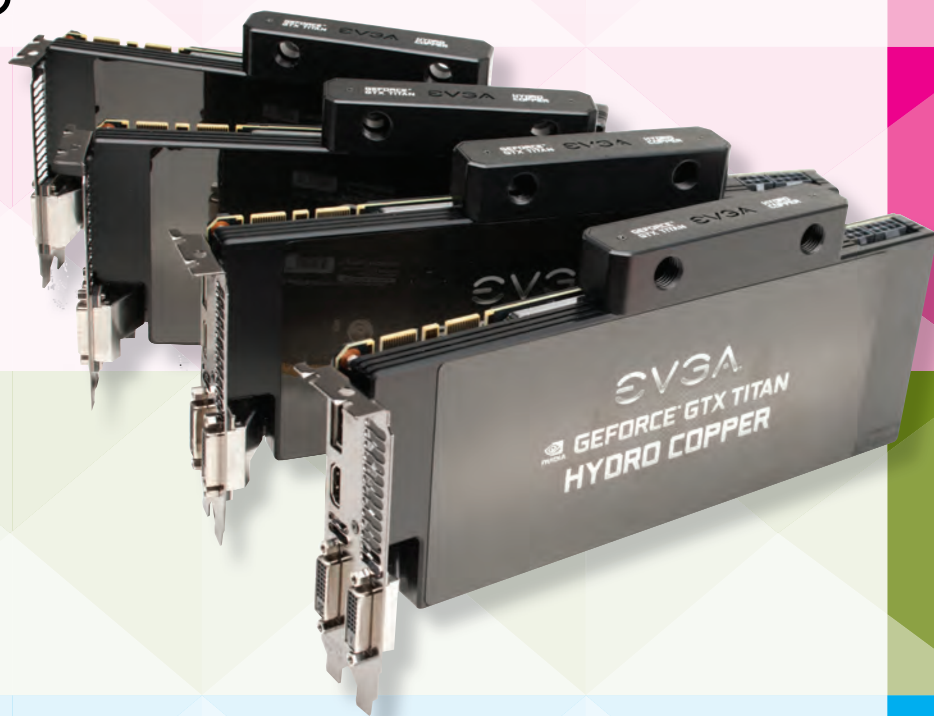
The Extended ATX board is a bit larger than others, but in the cavernous 900D, it practically looks like a microATX board. Since SNB-E parts and X79 don't officially support PCIe 3.0, we used Nvidia's utility to enable it. The difference? Not much that we could see on our 4K monitor, but it's nice to know we can run PCIe 3.0 on all four of our board's slots.

GPU

4X EVGA GEFORCE GTX TITAN HYDRO COPPER IN SLI

When evaluating the current crop of GPUs for possible deployment to the Dreamghanistan theater, the Titan was always a leading contender for obvious reasons. This $1,000 GPU is the fastest single GPU on the market by a huge margin, and though it's not as fast as a GTX 690, two Titans make a GTX 690 look like a quaint collection of silicon. And three Titans? Well, there's nothing else that can even begin to approach that level of performance. Which is why we have gone with the only choice possible given this magazine's pedigree—*four* GTX Titans, and not just regular Titans, but the water-cooled kind that cost more than most foreign-bred cat species.

Out of the box these tasty bits of gaming ordnance are overclocked 100MHz above stock speeds at 928MHz, with a boost clock of 980MHz.





Monitor

ASUS PQ321

You know what's wrong? That a frakking 10-inch tablet (and no, it's not the iPad) packs as many pixels as those "high-res" 30-inch panels. To put all tablets to shame, we had to up the ante with Asus's newly minted PQ321 using an Indium Gallium Zinc Oxide panel. The PQ321 packs 3840x2160 pixels into a 32-inch panel. How does that translate comparatively? Take two 30-inch, 2560x1600 panels and put them side by side and the PQ321 *still* has more pixels. If you had three 1080p monitors lined up, the PQ321 would exceed their combined pixel count by 25 percent. It's Retinastic ™!

There are so many pixels that it's beyond the capability of even dual-link DVI. The only way to display images on the PQ321 is to use its DisplayPort 1.2–compliant port along with a video card that also supports DisplayPort 1.2, or to daisy-chain across multiple HDMI ports. Fortunately for us, the Titan supports DisplayPort 1.2. We had to resort to beta drivers and we're using pre-production firmware on the PQ321, but it works, offering us glorious 4K Ultra HD quality. All we can say is that we're glad we've finally broken through the 2560x1600 barrier.

SSDs

2X SAMSUNG 840 PRO 512GB

We considered a PCIe-based SSD setup this year, but all those damned Titan cards prevented us from using one, so we went with the next best thing: two of the fastest SSDs available, in the highest capacity available. With only two SATA 6Gb/s ports on the Intel controller, we rocked dual Samsung 840 Pro 512GB SSDs for a single-terabyte partition for our OS, giving us 1Gb/s read and write speeds, and sub–15 second boot times. Hell, yeah.





More SSDs

2X CRUCIAL M500 960GB

The Crucial M500 is currently the highest-capacity SSD drive available at 960GB, but we didn't choose it just because of its huge size (for an SSD). We chose it because it's also one of the fastest drives in its class, and it's semi-affordable, too, at $600 per drive (previous 1TB drives cost over $2,000). Even though we have a terabyte of fast SSD storage for our OS, we ran two of these M500s for an extra layer of SSD storage, just because we could.

Hard Drives

3X WD CAVIAR BLACK 4TB

Not even the Dream Machine can get away with an entirely solid-state storage scheme, so we had to ask ourselves, "What is the fastest, highest-capacity mechanical hard drive these days?" After we polled the staff and consulted the benchmark charts, the answer was clear: WD's 4TB 7,200rpm Caviar Black hard drive. This one's got it all—a fast spindle speed, a long five-year warranty, and a fat 64MB buffer. We only used three because, well, we ran out of SATA ports.





Water Cooling

WHAT DIDN'T WE USE?

Dream Machine boasts 840mm of AX-series XSPC copper radiators with aluminum enclosures that help dissipate heat. They're strapped with 1,850rpm Gentle Typhoons on either side. Typhoons deliver top-tier performance while generating a relatively low amount of noise, which is preferable when you have 17 total in your case. We replaced the case's front fans with 1,450rpm Gentle Typhoons, and a 14cm Arctic Cooling F14 PWM fan replaces the rear. Typhoons don't come in the 14cm size, but the F14 is a high-caliber alternative.

EK's Supremacy Elite CPU blocks are premium hardware, with a price to match. Our trusty Swiftech MCP655 pump is not a bank-breaker, but it's highly reliable and has five speed settings. All of our Tygon silver tubing is attached with chromed compression fittings with an ID (inner diameter) of 3/8 inches using the G1/4 thread standard. The juice we set loose is simply distilled water, the base ingredient for any liquid-cooling system.

We also want to give a shout-out to FrozenCPU.com for all the help with the DM's waterworks.

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GREETINGS, HARDCORE PC USERS! There has never been a better time to come back to the all-new America Online, now optimized for the latest PCs using the hottest technology. The all-new America Online includes the following must-have features for PC enthusiasts:

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- **INTERNET EXPLORER 14 TITANIUM** The fastest and biggest (3GB!) version of Internet Explorer ever made, and only available with AOL!

Install this exclusive Sapphire Trial offer, and get AOL on your Dream Machine today!



Case
CORSAIR 900D



This isn't your grandaddy's beige; it's got a sexy sheen that rivals any sports car's.



The Corsair 900D is a thoroughly modern "super tower," with mounts for 16 fans, nine hard drives, 480mm radiators, and EATX motherboards. It's a giant mofo of an enclosure, with a shipping weight of more than 50 pounds. We ended up using nearly every available inch of space, and we could have used more. You need a lot of legroom to water-cool four video cards and a massively overclocked Intel Core-i7 3970X. The 900D is one of the few cases that can deliver.

The 900D cuts a fine figure in its stock matte-black trim, but for Dream Machine, we wanted more character. It's funny how such a low-key, otherwise forgettable shade of not-quite-white can trigger so many memories, from fond recollections of D&D Gold Box games to wrestling with IRQ conflicts into the wee hours of the morning.

All that nostalgia comes courtesy of our old friends at Smooth Creations. Yes, asking Smooth Creations to paint our Dream Machine case beige was a like asking SEAL Team 6 to work security at our 6-year-old's birthday party. But leave it to Smooth to make something as seemingly mundane as beige into a luscious, creamy paint job that's simply drop-dead sexy. (See if this doesn't become *the* look of the season.)

Smooth's work didn't stop at just the exterior; besides painting the outside vintage '97 Packard Bell Beige, the company also painstakingly turned the interior into a beautifully smooth silver that perfectly emulates the cheap pot-metal look of a case from the turn of the century. The real testament to Dream Machine's paint job is that the already handsome 900D, frankly, looks even better in beige.

RAM

64GB CORSAIR DOMINATOR PLATINUM

It's hard to believe, but this year we're "settling" for 64GB of Corsair Dominator Platinum RAM. Our original plan was to scrounge up 128GB of RAM using 16GB DIMMs, but there are no DDR3 16GB modules that aren't registered ECC parts. Even worse, Intel has intentionally neutered the civilian Core i7 to "just" 64GB. To get to 128GB, we'd need a Xeon. Oh, phooey. We guess we'll just have to slum it.





PSU

LEPA G1600-MA

Given our need to feed the mouths of four-way SLI and an overclocked CPU, we reached for the burliest PSU we could find: LEPA's G1600-MA unit. Fully modular, the G1600-MA gives us a continuous 1,600W, and we need every bit of that because the Dream Machine sucks power in a way no meager 1,000W or 1,200W PSU could muster. In fact, we found that we could use even *more* power for this setup, but we just couldn't fit it in the case.

Optical Drive

PIONEER 15X BDR-208DBK BLU-RAY BURNER

Last year, we made the bold, ostensibly "forward-thinking" decision to jettison the optical drive from Dream Machine. We figured the ubiquity of downloadable software and streaming media rendered the ol' ODD obsolete. Boy, did we get an angry earful! While an optical drive can be easily sacrificed when building on a budget, Dream Machine has no constraints, so why not include one? This year, we tapped Pioneer's 15x BDR-208DBK Blu-ray burner to wave the flag. Write speeds of 15x for BD-R, 14x for BD-R dual-layer, and 16x for DVD, plus brisk ripping chops, have all our optical needs covered.





Keyboard

IBM MODEL M

Few keyboards get the legendary reputation for sturdiness and typability that the IBM Model M has. With its buckling-spring design, typing on this bad boy makes you feel like you're reliving the late 1980s and early 1990s all over again. In fact, our Model M has a manufacturing date almost as old as one of our interns. If you're wondering how we got a 21-year-old keyboard to work, the Model Ms were manufactured in the United States for IBM's ill-fated PS/2 lineup and, fortunately, our motherboard has a PS/2 port.



Mouse

STEELSERIES SENSEI

Where other mice aim to impress with crazy, futuristic design and surplus buttons, the Sensei offers unparalleled performance in a classic and attractive form. Inside its metallic shell, the Sensei sports a 32-bit ARM processor, which enables you to customize nearly everything about how the mouse performs—from sensitivity to pointer acceleration to lift distance. No other mouse matches this level of control, and the internal processor allows you to use your personal settings no matter what computer your Sensei is connected to.

DREAM MACHINE: A SUPERCOMPUTER 20 YEARS AGO

Though the Dream Machine is a mere toy compared to modern supercomputers, it's not all that far removed from supercomputers of the previous era, which begs the question: Will we be using today's supercomputers as our home PCs in 20 years? To give you can idea of how far we've come, consider Intel's ASCI Red supercomputer of 1996. It packed 9,298 Pentium II Overdrive processors clocked at 333MHz and filled up 104 fridge-size cabinets. This rig was the first computer to ever achieve one teraflop of performance in the Linpack benchmark, meaning it could perform over 1 trillion calculations per second. In comparison, each Nvidia GTX Titan in the Dream Machine is capable of 4.5 teraflops, so theoretically, you could say we have the power of 16 ASCI Red's in just the GPU department alone. The crimson supercomputer also had 12TB of storage, just like this year's Dream Machine.

If all this means we can expect to be using a smaller version of today's supercomputers in the year 2040, then let's examine the current No. 1 supercomputer: China's Tianhe-2. This machine, which was deployed in 2013, two years ahead of schedule, has more than 3.2 million CPU cores, one petabyte of memory, and 12.4 petabytes of storage (a petabyte is 1,000 terabytes), and can throw down 30 *peta*flops, with a P. That will be one hell of a PC, but then again, that's the very definition of Dream Machine.

DREAM MACHINE 2013: BEIGE IS THE NEW BADASS

Tribute to yesteryear aside, we wanted to bust benchmark records!



Our beige box wouldn't be complete without iconic relics from a bygone era. Nagel and Netscape Navigator, anyone? Underneath the Retrofukation skin is Windows 8.

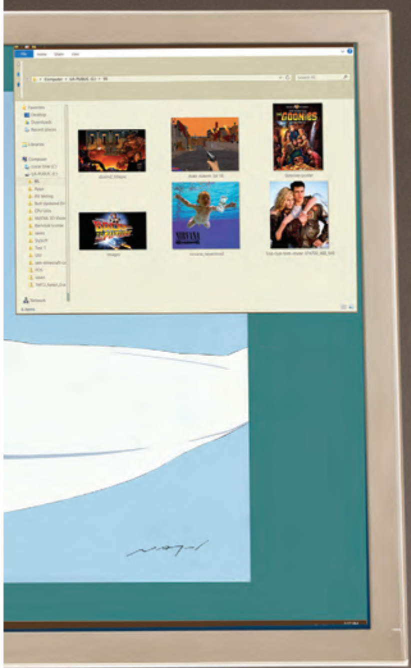
This year's Dream Machine may look like a throwback to 1996, but when it comes to performance, there's nothing old-school about it.

To test this year's Dream Machine, we used our standard zero-point machine, which is no slouch with its overclocked Core i7-3930K and GeForce GTX 690.

The benchmarks themselves are mostly custom workloads using off-the-shelf applications and favor either high clocks, processor efficiency, or core count.

Since our benchmarks haven't changed in a little over a year now, we have a fairly lengthy record of machines we can use in comparison to Dream Machine 2013.

This year's Dream Machine buzzes along at 5GHz, but for the most part, it's still a Sandy Bridge-E CPU, just like the overclocked SNB-E in our zero-point box. Dream Machine's 5GHz is about 30 percent higher than the 3.8GHz of the zero-point, and the results were pretty predictable. In computing tests, DM2013 enjoyed a 25 to 27 percent performance boost. In gaming, though, we're not running quite the same GPU. The zero-point sports a GeForce GTX 690, which is pretty much the equivalent of two GeForce GTX 680s in SLI. How much faster is this year's Dream Machine? Try 134 percent in Batman: Arkham City and 194 percent in 3DMark 11, baby. Not bad.



Of course, the zero-point box isn't the only rig in town. We've been keeping a tally of all the world-class production boxes that have crossed our paths, and in that elite club, two PCs in particular come to mind: the Maingear Shift that we reviewed in August and the Geekbox Ego Maniacal that we reviewed in February. The Geekbox Ego Maniacal uses the same Core i7-3970X, while the Maingear Shift is powered by Intel's new Haswell Core i7-4770K chip. Both über desktop machines currently hold the bulk of our benchmark records.

The Geekbox Ego Maniacal could be a soul mate to the Dream Machine. It packed the same CPU, albeit clocked down a tad to 4.8GHz, and at its time, its two GeForce GTX 690 cards were as good as it got in GPUs, which allowed it to slice through our benchmarks with abandon. Compared to Dream Machine 2013, CPU performance is pretty close. It's damn near a tie in Premiere Pro CS6, but DM2013 manages to pull down a 5 to 6 percent advantage in Stitch.Efx and x264 encodes. It's also very close in ProShow Producer, but the cigar still goes to Dream Machine. Applause, please.

As for how a pair of GeForce GTX 690s does against four Titans, it's no contest. Dream Machine has a 33 percent boost in Batman: Arkham City and a whopping 42 percent in 3Dmark 11. Buh bam. Yeah, to be fair, an updated Geekbox would likely produce similar results, but until then, we'll use more sound effects: Zam zing!

Believe it or not, our real concern was actually the Maingear Shift box. With its Haswell clocked at 4.7GHz, we didn't know if it could be beat. In fact, it couldn't be beat in everything. Stitch.Efx, for example, is only multithreaded for the last third and ProShow Producer 5.0 tops out at four threads. These scenarios favor the more efficient Haswell microarchitecture over Sandy Bridge-E. Clock for clock, Haswell is about 15 to 18 percent faster than SNB-E. Luckily, the higher overclocking capability of Sandy Bridge-E keeps Dream Machine within striking distance and it trails the Maingear Shift by just 5 percent in those two benchmarks. Dream Machine gets payback, though, in the more multithreaded tasks, and we see a 31 percent advantage in Premiere Pro CS6 and an even better 34 percent advantage x264 HD 5.0. Take that, quad-core!

In gaming, it's a give and take. The Maingear Shift has a tri-SLI Titan setup while Dream Machine has four-way. In Batman: Arkham City, the Shift's Haswell part again pays off dividends and it wins by 3 percent. In the more GPU-heavy 3DMark 11, though, the additional Titan in DM2013 gives about 24 percent more performance.

In pure benchmark records, Dream Machine 2013 holds three titles, as it unseats the Geekbox in Premiere Pro and x264 and pushes the Maingear Shift into second place in 3DMark 11. Oh, and as of this writing, the Dream Machine would be ranked No. 6 on the 3DMark Hall of Fame leaderboard. Not bad, when you consider the top spot is achieved using liquid nitrogen.

In 4K gaming, we saw amazingly playable performance, with Dream Machine giving up 56.9fps in Hitman: Absolution. When set to Ultimate, DM2013 achieved 113fps in Tomb Raider, and 89.2fps in Heaven 3.0 and 53fps in Heaven 4.0. Some will say quad Titans are overkill, but the 4K gaming results clearly show their advantage.

BENCHMARKS

	ZERO POINT	
Premiere Pro CS6 (sec)	2,000	1,605
Stitch.Efx 2.0 (sec)	831	671
ProShow Producer 5.0 (sec)	1,446	1,161
x264 HD 5.0 (fps)	21.1	26.8
Batman: Arkam City (fps)	76	178 (134%)
3DMark 11	5,847	17,199 (194%)

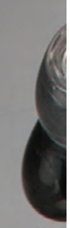
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K@3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.



The Ultimate Thumb Drive Toolkit

Five ways to put your collection of neglected thumb drives to good use **BY MARCO CHIAPPETTA**



ALTHOUGH THEY WERE once considered expensive luxuries to most users, USB thumb drives have become nearly as ubiquitous as the now defunct floppy disk. Thumb drives of all shapes and sizes are currently sold at corner drug stores, freely disseminated at trade shows, and even given out as digital business cards. Thumb drives are so commonplace now that it's not unusual for PC users to have amassed huge collections of drives that, for the most part, do little else but sit around collecting dust. We speak from experience.

Though some of the drives you'll have lying around are likely to be small in terms of their usable capacity, that doesn't mean they're useless. Even thumb drives with capacities of only a few megabytes can still come in handy for creating things like bootable DOS disks, which can be used to flash the BIOS on an older motherboard or graphics card, or even bootable disks with a full-blown HTPC operating system.

We're going to cover a number of handy projects in this article that'll help put those neglected thumb drives to good use. Before we continue, though, a word of caution: All of these projects will destroy the data stored on the drives. If there's anything important on them, back it up before attempting any of the projects listed here. You'll be happy you did—trust us on this one.


Flash
SURVIVOR
CORSAIR
FlashVoyager
CORSAIR
Kingston

Create a Custom Windows Install Disk

Speed up and minimize the hassle of installing Windows

Many of us have installed Windows more times than we can count. Whether it's for building or testing a new system or repairing an older rig, installing Windows can be a regular occurrence. With more recent versions of Windows, the installation process has become more streamlined, but it can still be a chore, especially if you're using optical media and have to manage multiple discs and product keys for all of the different versions that are available. Thankfully, there's a faster and easier way to do it using a USB thumb drive.

There are a number of ways to create and customize a Windows installation disk. We're going to outline one of the easiest methods here using Microsoft's own Windows 7 USB/DVD download tool (the same process works with Windows 8, too) and a bit of simple file editing. When done, you'll have yourself a customized Windows installation disk that can install any edition of Windows—like Home Premium and Ultimate or Windows 8 and Windows 8 Pro—and it won't require a product key during the installation process. There are much more involved methods for customizing a Windows installation disk, which can also give users the ability the incorporate applications and drivers and even pre-configure many settings, but for most enthusiasts, the method we'll outline here should still come in quite handy.

GATHER YOUR MATERIALS

Before you begin, you'll need to have a USB thumb drive with a capacity of at least 4GB (larger is better if you want to store other files on the drive), ISO files for Windows 7 or 8 (a Google search will lead you to a legitimate source for the ISO you need, such as Digital River), a copy of Microsoft's Windows 7 USB/DVD tool (download here: http://bit.ly/162L74X), and, of course, a PC running Windows to complete the process. Note that the Windows 7 USB/DVD tool requires the .NET Framework to be installed on your machine, so you may need to install that, as well.

INSTALL FILES TO DRIVE

Once you've got your ISO file(s) handy, connect the thumb drive to your system, note its drive letter, and then install and run the Windows 7 USB/DVD tool. On the initial screen, you'll be prompted to browse for your Windows ISO file. Click the Browse button, navigate to wherever you saved the ISO, click the Open button, and then click Next. On the subsequent screen, you'll be asked to choose your media type. The Windows 7 USB/DVD tool can create a bootable DVD or USB device. Since we're focused on thumb drives here, click the USB Device button. On the next screen, choose your thumb drive from the drop-down menu and then click the Begin Copying button. The Windows 7 USB/DVD tool will format and prep the thumb drive and then copy over all the necessary installation files automatically.

When the Windows 7 USB/DVD tool is done doing its thing, close it, and you're technically finished and ready to go. However, by default, the installer will only offer the option to install whichever version of Windows was designated by the ISO used to create the drive (Home Premium, Ultimate, etc.). Windows 7 and 8's image-based installation method is capable of installing any edition of Windows (within the same family) with a bit of tweaking, though.



Microsoft's Windows 7 USB/DVD tool can prep a thumb drive and copy the installation files over in just a few simple steps.

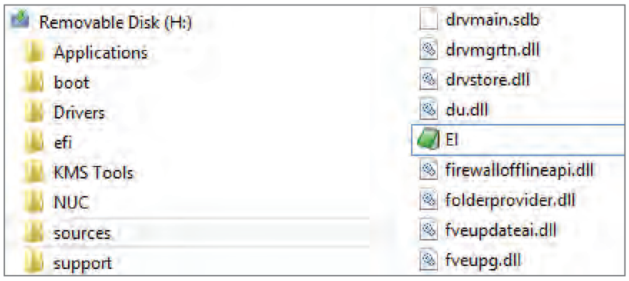
EDIT YOUR ISO FILE

If you created a Windows 7 install drive, insert it into your PC and browse to the \sources\ directory. In that directory, delete the file named ei.cfg. With Windows 8 the process is a bit different. Create a simple text file named ei.cfg (or edit the one you have if it is already present) with the following contents:

```
[Channel]
Volume

[VL]
1
```

Save the file and you're done.



Deleting or editing the ei.cfg file in the \sources directory on a Windows installation disk will allow different versions of Windows to be installed using the same media.

THE RESULTS

So, how much time can you save installing Windows from a USB thumb drive? When using a USB 2.0 flash drive, it took Windows 7 Ultimate x64 six minutes, 14 seconds to go from the "Windows is loading files" prompt to the "Completing installation" prompt on a Core i5 Dell laptop equipped with a 128GB SSD. Performing the same test with a USB 3.0 drive resulted in a time of only five minutes, 49 seconds. When timed using the Windows 7 installation DVD, however, the same process took 13 minutes, 51 seconds. That's a big time savings, especially if you find yourself installing Windows often. Store all of your favorite applications and most commonly used drivers on the thumb drive as well, and you can have them all installed right away, too, without having to swap a single disc.

Take Your Apps on the Go

Portable apps let you use any PC without leaving a trace

By far, one of the handiest things to do with a USB thumb drive is to create a mobile workspace, loaded up with portable apps. If you're unfamiliar with portable apps, they're essentially self-contained versions of programs that work entirely from their installation directory and don't leave any trace on the host PC. Once configured, you can take your thumb drive loaded up with portable apps anywhere, plug it in, and all of your favorite applications and data will be right there waiting for you.

Portable versions of popular applications are freely available from many developers' websites. Technically, all that's required to use a portable app is to download and install/run it right from a thumb drive. If you'd like to have a wide assortment of portable apps available, however, managing them all can get a bit unruly, since you can't simply create a directory of shortcuts—the shortcuts break if the thumb drive's drive letter changes. But that's where the PortableApps Platform comes in.

ENTER PORTABLEAPPS

The PortableApps Platform is an easy-to-use launcher for managing and running portable apps. To use it, download the tool from www.portableapps.com and install it to your thumb drive. While on the site, you can download a wide array of portable apps too. Install the portable apps to the thumb drive as well, and when you run the PortableApps Platform (by double-clicking the Start application on the root of the drive), all of your apps will be listed in a Start-Menu-like launcher.

Some of our favorite portable apps are Firefox, FileZilla, 7-Zip, OpenOffice, and GIMP. For the most part, if there's a popular open-source desktop application available, there's a portable version of it out there, too.



The PortableApps launcher gives you easy access to all of your portable apps from a single interface.

Install a Dedicated HTPC OS

Use OpenELEC on a thumb drive for media duties

There's a lot of debate among home theater PC enthusiasts. Some prefer their HTPCs to be Jacks-of-all-trades that run Windows and are as adept at playing movies as they are at running desktop applications. Others prefer their HTPCs to be simple boxes that are strictly for multimedia playback.

Well, why not have both?

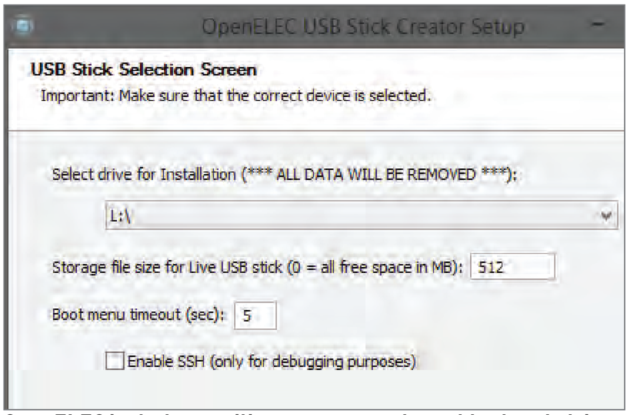
The Open Embedded Linux Entertainment Center, or OpenELEC, is a tiny Linux distro that leverages XBMC (formerly known as the Xbox Media Center) and can be run right from a bootable thumb drive (or any external drive, for that matter). With OpenELEC, your HTPC's internal drive can boot whatever OS you like, but should you choose to go the streamlined route, you can boot from the OpenELEC-equipped thumb drive and quickly access your media.

GET OPENELEC

If you'd like to give OpenELEC a try, point your browser to www.openelec.tv and download the distribution that best matches your hardware. There are versions for AMD APUs, Intel processors, and Nvidia Ion-based platforms—among many others—with file sizes of only 80–125MB. Once you've got the distro downloaded, decompress it into a folder, and connect the thumb drive you'd like to use to your PC—it can be as small as a few hundred megabytes.

In the folder where you've decompressed OpenELEC, you'll find a file named create_livestick. Double-click it, and follow the on-screen prompts to prep the thumb drive and install OpenELEC. The process requires only four clicks: two to start the installation and accept the license agreement, a third to select the thumb drive (which should be automatically identified), and a fourth to finalize the installation.

When the OpenELEC installation is done, connect the thumb drive to your HTPC and boot from it. On the initial splash screen you'll be asked to either install it to the PC or run the live edition right from the flash drive. Run the live edition and configure XBMC to your liking and you're good to go.



OpenELEC includes a utility to prepare a bootable thumb drive containing the OS.

Create the Ultimate USB Boot Drive

Arm yourself with the tools to meet any PC emergency

Every PC tech, amateur, or pro needs a boot disk in their arsenal jam-packed with various apps and utilities for recovering files and passwords, scanning for malware or disk defects, taking disk images, and myriad other essential tasks. There are a handful of excellent options to choose from, but few offer as extensive a line-up of applications as Hiren's Boot CD.

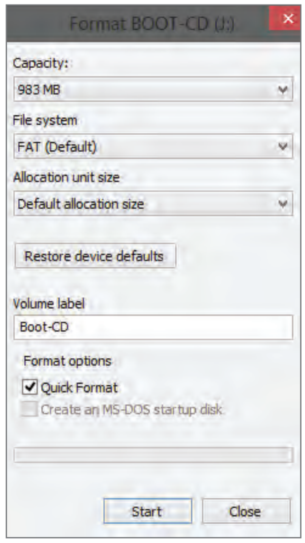
Hiren's Boot CD, available at www.hirensbootcd.org, started its life as a less-than-savory tool rife with pirated software. But the developers have since gone legit and replaced all of the pirated apps with excellent freeware alternatives. The Hiren's Boot CD ISO is meant to be burned to a disc so it's write protected and insulated from malware, but it can also be written to a thumb drive using a couple of freely available utilities.

PREPARE YOUR DRIVE

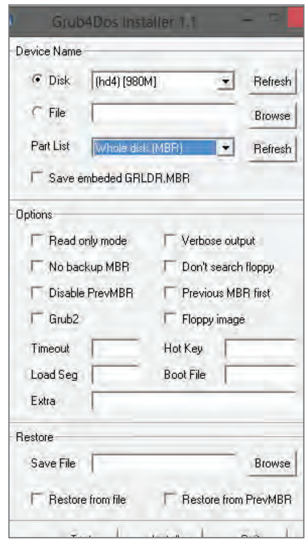
To create a bootable thumb drive with Hiren's Boot CD files, you'll need a drive with a capacity of at least 1GB, a copy of the Grub4DOS Installer (also available at HirensBootCD.org), the Hiren's Boot CD ISO, and if you're on Windows 7, a utility like WinRAR or 7-Zip to extract the necessary files from the ISO (Windows 8 can mount ISO files natively, so you won't need a separate utility). Once you've got everything gathered up, connect your thumb drive and format it using the FAT file system (right-click the drive in File Explorer and choose Format from the menu), to ensure the drive is free of any data. Then run the Grub4DOS Installer utility as an administrator. In the program window that opens, click the Disk radio button and then select your thumb drive from the adjacent drop-down menu. Then, hit the Refresh button next to the Part list drop-down menu and select Whole disk (MBR) from the associated drop-down. Hit the Install button at the bottom of the interface to install the Grub4DOS universal bootloader to your thumb drive—it'll only take a couple of seconds.

POPULATE YOUR DRIVE

Once you've got the Grub4DOS bootloader installed, the next step is to copy all of the Hiren's Boot CD files over to the thumb drive. Extract the files from the ISO (or mount it if you're on Windows 8) and copy all of the files and folders to the thumb drive. When all of the files have been copied over, navigate to the HBCD folder on the drive and copy the grldr and menu.lst files within the HBCD folder to the root of the drive. Once the grldr and menu.lst files have been placed on the root of the drive, it's ready to use.



To prep your drive, format it first to ensure it is clean and free of data.

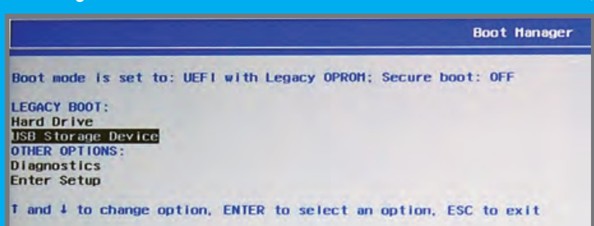


You'll need to install the Grub4DOS bootloader to your thumb drive before it'll run Hiren's Boot CD.

Troubleshooting: Booting from USB

All modern systems should offer the ability to boot from a USB drive, barring some corporate PCs that may have security measures in place to prevent it. Should you have problems booting from a USB drive on your personal system though, there are a few things that could be at play. First, check that your system is configured to boot from the USB drive. Connect the drive, restart the system, enter the BIOS (usually by hitting Del or F2 during the POST), and under the Boot menu make sure the USB drive is being recognized and that it is first in the boot order. On many systems, you can usually hit F11 or F12 during the POST to load a one-time boot menu as well, and select the USB drive there. You may also have to enable the option to boot from USB, depending on your motherboard manufacturer.

If none of that works, there's also a chance there's an incompatibility between your drive and a third-party USB controller. Plug your drive into a USB port that's native to your motherboard's chipset and then try booting again. Another possibility is some sort of corruption on the USB drive itself. As a last resort, copy all of the data from the drive to your PC and use Windows' Diskpart utility to clean the USB drive of any partitions, then create a new primary partition, set it to active, and reformat/reconfigure the drive. We've got a more detailed step-by-step on using Diskpart in the "Windows to Go" section on page 49.



Your system won't boot to the USB drive unless it's selected in the BIOS or boot menu.

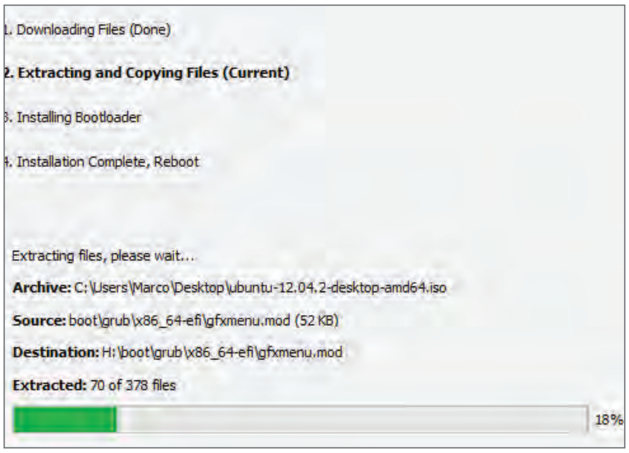
Create a Linux Live Bootable Key

Try any version of Linux, without altering your current system

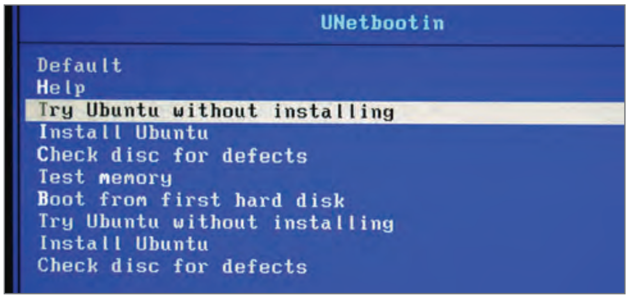
Experimenting with different versions of Linux is a great way to utilize those thumb drives cluttering up your junk drawer. There are a ton of utilities out there that can help ease the setup process, but one in particular, the Universal Netboot Installer, or UNetbootin for short, makes the entire process, from selecting and downloading a distro to prepping a thumb drive, about as easy as could be.

GET UNETBOOTIN

UNetbootin can be downloaded at http://unetbootin.sourceforge.net. It is a stand-alone utility that doesn't need to be installed. Once downloaded, simply double-click the file to run UNetbootin and on the initial screen you'll have two options: to either select a distribution to download and install (there are hundreds to choose from) or to create a bootable thumb drive using a pre-downloaded ISO. If you'd like to experiment with different Linux distros, UNetbootin will download and install them to your flash drive right from its main interface—there's no need to scour the web on your own. If you've already got some ISOs downloaded and just haven't gotten around to burning them, UNetbootin can use those, too. For the purposes of this project, we downloaded the popular Ubuntu Linux ISO, but just about any distro should work.



UNetbootin is a one-stop shop for downloading and creating Linux Live bootable thumb drives.



The UNetbootin boot menu gives you the ability to run Linux right from the thumb drive or to install it to the host PC.

CREATE LINUX LIVE DRIVE

To create a Linux Live USB drive, UNetbootin extracts the necessary files from an ISO, copies them to the thumb drive, generates an appropriate config file, and then makes the drive bootable. To use UNetbootin, connect your thumb drive to your PC, run the utility, and download a distro (or choose your pre-downloaded ISO) right on the initial screen. The thumb drive should be a few hundred megabytes at minimum, but larger (think 2GB-plus), faster drives are preferable. Once you've chosen the distro and selected the thumb drive from the menu, click the OK button and UNetbootin will download and/or extract the necessary files and automatically copy them to the thumb drive. The utility will then make the drive bootable, and when complete, UNetbootin will prompt you to exit or to restart the system, should you want to give the thumb drive a try right away.



Most Linux distributions, like Ubuntu, which we used for this project, run very well from a USB thumb drive.

PUT IT TO USE

To use your Linux Live bootable thumb drive, simply boot to it, and at the UNetbootin menu select "Try Ubuntu without installing" (or whichever distro you chose). The OS will run right from the thumb drive as if it were installed locally on the host PC.

Linux Live bootable drives are particularly useful for not only learning your way around Linux, but also as pseudo-recovery discs, as well. If you've got a Windows PC that won't boot and you need to recover files, booting to a Linux Live drive may allow you to access the system's hard drive and copy whatever files you may need.

Set Up a Windows to Go Environment

The perfect excuse for buying a new USB 3.0 thumb drive

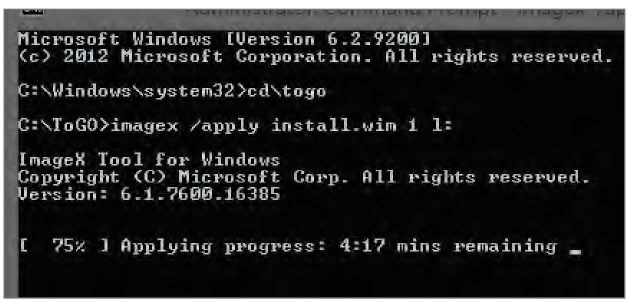
One of the coolest new features of Windows 8 is its ability to run from a USB thumb drive. Microsoft calls the feature "Windows to Go." With Windows to Go, you can install Windows 8 and all of your favorite applications and tools to a thumb drive, plug it into a PC, boot to the drive and your entire workspace will be available.

To create a Windows to Go portable environment, you need a USB 3.0 thumb drive with a capacity of at least 32GB, a Windows 7 or 8 PC to actually configure the thumb drive (Windows 8 is preferable because of its native ability to mount ISO files), Microsoft's Automated Installation Kit, or AIK (available here: http://bit.ly/relfql), and a Windows 8 installation disc or ISO.

FIRST THINGS FIRST

If you've got everything available and downloaded, install the Windows AIK first. It'll create a \Program Files\Windows AIK directory with a number of other directories within. In the \Tools subdirectory, you'll see a number of other subdirectories labeled with specific system architectures. If you're creating the Windows to Go drive on a system running a 64-bit edition of Windows, open the \amd64 folder. If you're running a 32-bit edition of Windows, open the \x86 folder. In those folders you'll see a file named ImageX.exe. Copy ImageX.exe and place it into a new subdirectory of your choosing—we used C:\ToGo.

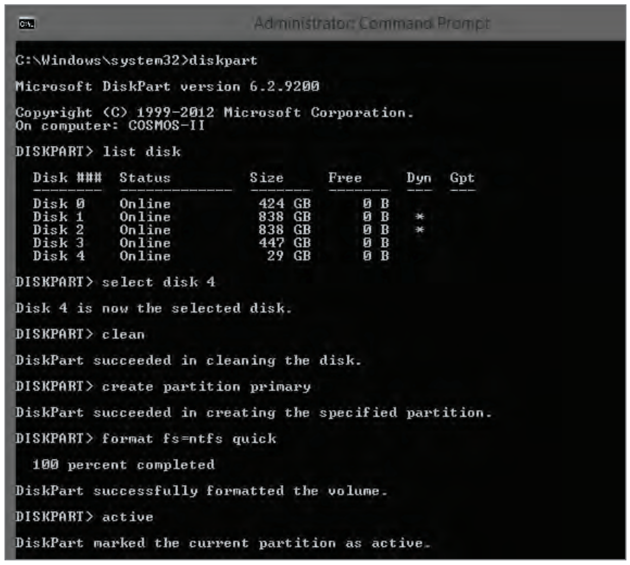
Once you've got the correct ImageX utility copied, you need to extract the Windows installation image from the Windows 8 ISO. Mount the ISO (or extract it to a folder) and in the \sources directory find the file labeled install.wim and copy it to the same directory in which you placed the ImageX utility.



The ImageX utility included in the Windows AIK is used to install the Windows image to the USB flash drive.

PREP YOUR DRIVE

With ImageX and the Windows 8 install.wim file copied, it's time to prep the flash drive. Connect the drive to your system, then open a command prompt as an administrator and run Diskpart. At the Diskpart prompt, first type **list disk** and hit Enter to see a numerated list of drives connected to your system—on our machine, the thumb drive we wanted to use was listed as Disk 4. When you know the number of your thumb drive, type **select disk 4** (replace the 4 with the number of your drive) at the Diskpart prompt and then hit Enter again. Once the proper drive is selected, you've got to run a handful of commands to clean, re-partition, and reformat the drive in preparation for the Windows to Go installation. Type the following commands in succession, hitting Enter after each one: **clean**, then **create partition primary**, then **format fs=ntfs quick**, then **active**, then **assign**. Then exit the Diskpart utility and navigate to the directory where you placed the ImageX and Install.wim files. Since we used C:\ToGo, at the command prompt we typed **cd\ToGo** and hit Enter.



Use Windows' built-in Diskpart utility to clean the flash drive, create an active primary partition, and format it with the NTFS file system.

INSTALL WINDOWS

The next step is to actually install Windows to the flash drive using ImageX. At the command prompt, type: **imagex /apply install.wim 1 X:** (where X is the drive letter of your flash drive). This command tells ImageX to apply the first image within the install.wim file to drive letter X. The installation process will take a good 15–20 minutes or so depending on the speed of your drive. Once the ImageX process is complete, the next step is to install the correct boot record. While still at the command prompt, type **bcdboot.exe X:\windows /s X: /f ALL** (again, replace the X with the drive letter of your thumb drive) and hit Enter. This command tells the bcdboot utility to install the boot record from X:\windows directory to the root of the drive.

Once the boot record is installed, your Windows to Go drive is ready to use. The first time you boot to it on a system, it'll detect new hardware and configure the necessary devices, but it'll eventually load the Modern UI and behave just like a local Windows installation. Activate the OS, install your applications and any necessary drivers, and you're done.

GOT START?

YOU CAN WAIT ALL YOU WANT, MICROSOFT ISN'T GOING TO RETURN THE BELOVED START MENU TO WINDOWS 8. BUT HOPE IS NOT LOST, THANKS TO THESE HANDY THIRD-PARTY TOOLS! **BY DAVID MURPHY**

BEYOND ALL of the colorful tiles; the bolted-on Modern user interface; the giant, full-screen apps and panels; and the inability to boot to the desktop—to name just a few of our gripes—there's one issue above all others that's guaranteed to universally frustrate Windows 8 desktop users: the Start Menu.

Specifically, Microsoft's decision to remove the Start Menu entirely from Windows 8, giving users no recourse for adding it back as an optional alternative or supplement to the Modern UI's tiled application shortcuts and search tool, which are Windows 8's means of navigation.

We can fix that.

Perform a simple search for "Windows 8 Start Menu" and you'll find a smorgasbord of apps with one purpose in mind: bringing back the button at any cost. The last thing you want to do is muck up your Windows 8 installation with a junky program, however—worse, to have wasted your time installing numerous Start Menu apps in an effort to find out which one is best (or prettiest).

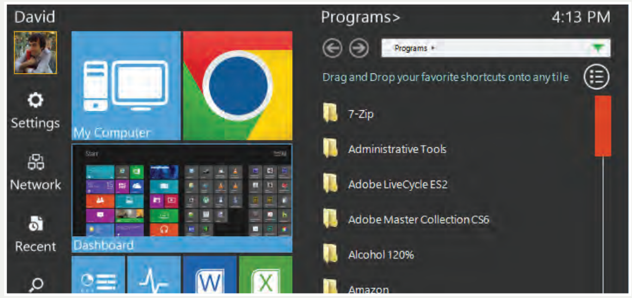
Worry not. Your Start Menu is coming back. And with 11 different apps in our Start Menu roundup, we're going to show you the best free and paid-for ways to get it.



FREEWARE

START MENU REVIVER

It's a Start Buffet, not a Start Menu



We appreciate what Reviver-Soft is trying to do with its free Start Menu Reviver app. In many ways, the Start Menu that the app creates is like a miniature hybrid of Windows Modern and a conventional Start Menu. Big, bulky boxes give you access to your computer's contents, your Internet browser of choice, the Modern dashboard, and what can only be described as a semi-shrunken version of Modern itself for quick app access.

With some tweaking of Start Menu Reviver's limited configuration options you can create a vague resemblance to the conventional Start Menu. But even then, the app feels like it wastes space—we'd rather see more of our folders and shortcuts at once.

To balance out that annoyance, however, the app features a ton of links to various parts of the OS—and the ability to bypass Modern completely when Windows 8 boots.

www.reviversoft.com

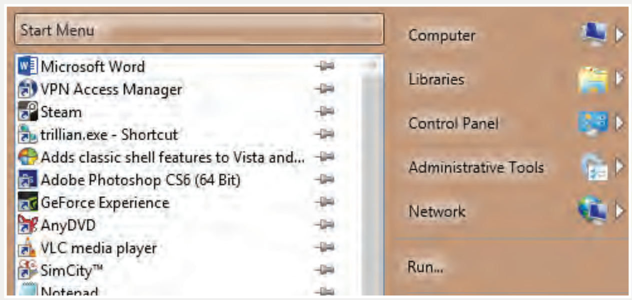
HIGHLIGHTS

- Packed to the gills with links and shortcuts.
- Not a ton of configuration options on this one.
- Start Menu folder structure could be presented much better.

FREEWARE

POWER 8

We give it a Power 1



Sorry, Power 8 just doesn't do it for us. First, we hate that there's no way to assign your keyboard's Windows Key to pull up this app's Start Menu instead of Modern. The app is also a bit too thorough when it comes to disabling Modern's Hot Corners—useful if you want to try and click its tiny Start button without accidentally activating a Windows 8 hot corner, but poor if you want to access any of the hot-corner options.

About that Start button—we wish that Power 8 came preconfigured with a larger button than the wee sliver the app stashes on the lower-left corner of your screen. The app's glowing shortcut text is a bit tough on the eyes, and you're forced to click a giant "Start Menu" button within the, er, Start Menu, just to access your standard Programs folder. No, thanks.

https://code.google.com/p/power8

HIGHLIGHTS

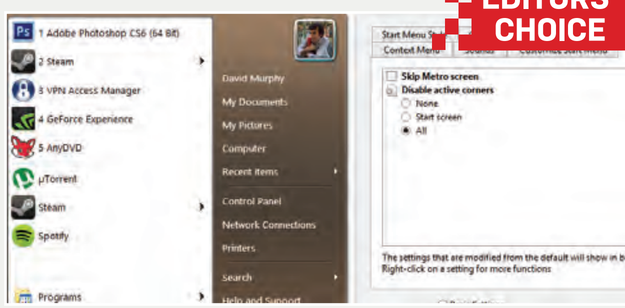
- Big on pinning, if there's a small list of apps that you only really ever use.
- Doesn't work with your Windows Key; disables too much of Modern with no customizability.

FREEWARE

CLASSIC SHELL

A Swiss Army knife of Start Menu approaches

EDITORS' CHOICE



The freeware app Classic Shell is a bit like using a bazooka to kill a fly. In this case, we commend the carnage. Once installed, the app allows you to slap a Start Menu button directly within Windows 8's Desktop Mode that can be configured to operate in one of three ways: Windows Classic, Windows XP, or Windows 7.

And, yes, Classic Shell comes with illustrated examples for those who don't quite remember the differences between the three Start Menu setups.

Other fun tweaks the app enables are the much-longed-for ability to bypass Windows 8's Modern UI entirely in favor of a direct boot to Desktop Mode, a sea of configuration options that you can use to tweak your Start Menu to your liking, and Classic Explorer, which adds some creative visual tweaks to File Explorer itself!

www.classicshell.net

HIGHLIGHTS

- A great app for ignoring Modern completely.
- Highly customizable, with more options than Windows would give you natively.
- Bonus tweaks to File Explorer, which you can enable and disable at your leisure.

FREEWARE

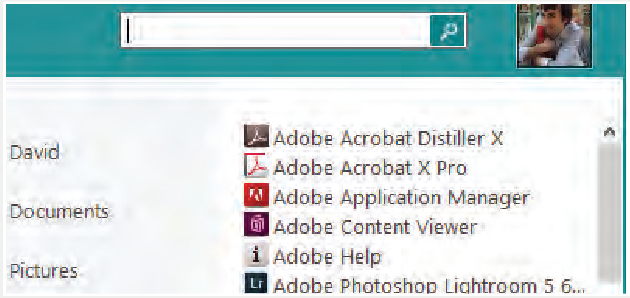
VISTART

Not too shabby, minus its weird name

It might feel a bit jarring at first when ViStart asks you to create a new Toolbar that it'll use as your Start button, but don't be scared off by the app's treatment. You can still tap your Windows Key to launch the new menu—or at least, we could until the Windows Key started loading Modern again (a quick reset fixed that).

ViStart's scrolling programs menu mimics the conventional Windows 7 Start Menu, and its left-most shortcuts are convenient and customizable—you can even add brand-new ones if you're down for a little bit of text-file editing. The app lets you bypass Modern upon booting and lets you customize which of Windows 8's hot corners you'd like to flip on and off—a lovely touch. The app's search leaves a little to be desired, as you can't Ctrl-A all of your text and delete it *en masse* when you want to search for new things.

http://lee-soft.com/vistart



HIGHLIGHTS
- Simple look and feel with a variety of switchable skins and decent display configuration.
- Scrolling programs menu should be replaced with one that shows all of your programs and folders at once.

FREEWARE

STARTW8

Simple, easy, could be a bit more customizable

The no-frills freeware app StartW8 throws up a fairly simplified iteration of Windows 7's Start Menu within your Windows 8 installation, up to and including the familiar scrollable list of folders and shortcuts buried within its "All Programs" link.

It's a bit of a bummer that StartW8 doesn't come with a way to pin most-used shortcuts to the Start Menu itself, or even change the order in which your shortcuts appear on StartW8's "recent" section.

Nestled within Start8's settings menu is a useful option that lets Windows 8 skip away from Modern and pull up your Windows Desktop when the OS loads. You're also allowed to disable Modern's hot corners in various configurations—we appreciate that Start8 resists an "all or nothing" approach. StartW8 lets you edit the menu items that the app tosses on the rightmost part of the Start Menu, but you can't customize your own shortcuts.

www.areaguard.com/startw8



HIGHLIGHTS
- A few-frills Start Menu app that gives you a classic, compact look.
- You can't really manipulate your typical Start Menu shortcuts (our kingdom for a "pinning" option!).

FREEWARE

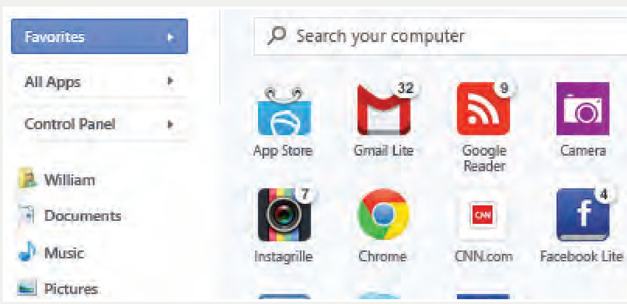
POKKI

A lovely looking Start Menu… if it installs

Pokki isn't so much a Start Menu replacement as it is a kitchen sink of utilities for the social enthusiast. In theory, the app gives you a brand-new Start Menu in Windows 8 that's packed full of far more than you probably need on your Start Menu, including hooks to an app store that you can use to supplement your Pokki Start Menu with social networking tie-ins, games, and other web-themed fare.

The problem? It doesn't work. We had a great deal of trouble getting Pokki installed on our 64-bit system; either the app would install "correctly" and just not do anything (or even give the appearance that it was installed on our system), or the installation program would just hang, and hang, and hang. Trying to uninstall Pokki after an unsuccessful installation informed us that we didn't have sufficient rights to do so. Argh.

www.pokki.com



HIGHLIGHTS
- Start Menu certainly looks pretty, but we're wary of additional tie-ins.
- Frustrating installation setup, in that it didn't work out for us at all.
- Perhaps Windows 8 (x64) users need not apply?

FREEWARE

START MENU 7

Display all the apps

Boom! That's the sound Start Menu 7 should make the first time you click its four-color icon and get all of your programs blasted across your screen on one of the largest Start Menus we've ever encountered—thankfully, you can adjust the menu's height and width as if it were a standard Windows… window.

You can configure Start Menu 7 to load itself, or Modern's Start screen, via your keyboard's Windows Key (or Shift + Windows Key combination). Flipping Windows 8's hot corners on and off is as easy as clicking the available graphic and, yes, Start Menu 7 can bypass Modern when your system boots.

The app comes with five different skins for its Start Menu. More importantly, you can use the app to create "virtual groups" of folders and shortcuts for extra organization. The app's "pinning" process for sticking shortcuts to the Start Menu could be a bit more streamlined, however.

www.startmenu7.com

HIGHLIGHTS

- All of your apps in one giant start menu!
- Virtual folders can help get your shortcuts a bit more organized.
- Creating a "Favorites list" of shortcuts is a little annoying.



WHAT'S NEW IN WINDOWS 8.1?

As we go to press, details are emerging about this little ol' thing called Windows 8.1, a Service Pack–like update to Windows 8 that brings a number of cosmetic improvements to the operating system, at the very least.

The biggie? The Start button is back, but don't get your hopes too high—Microsoft isn't building a Start Menu back into Windows 8's Desktop Mode. Instead, users are just going to get a quick shortcut to Modern's "All Apps" mode with the added bonus that they'll now be able to rearrange apps instead of being stuck with Windows' current alphabetical implementation.

Users will also be able to set a single wallpaper image that spans both Windows 8's Desktop Mode and Start screen, which has the potential to alleviate some of the unpleasantness that comes from switching between the two UIs.

Those who actually use Modern might appreciate the fact that Microsoft is throwing two additional tile sizes into the mix, and those who dislike the UI will enjoy the "Boot to Desktop" functionality that will allow haters to bypass Modern entirely when Windows 8 starts up.

PAIDWARE

STARTISBACK

A Windows 7 Start Menu with little to no fuss

As an Irish lad, this reviewer does appreciate that StartIsBack uses a shamrock embedded in an orb as the default icon for the Start Menu it jury-rigs into your operating system. Even better, the Start Menu itself looks and operates swimmingly—as if you ripped it straight out of Windows 7 and dumped it into Windows 8. In fact, we'd assume you were just natively running Microsoft's older OS if you sat us down at Windows 8's Desktop Mode with StartIsback running. It's that slick.

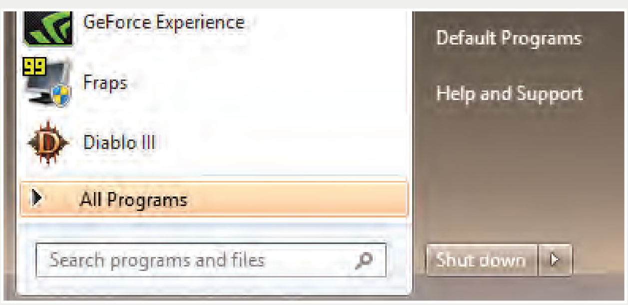
StartIsBack comes with a number of configuration options for tweaking the look and feel of your Start Menu. The app also lets you bypass Modern entirely when booting, though it also gives you a host of options for configuring the nuances of Modern's hot corners.

Our favorite trick? The option that lets you sticky a taskbar within Modern itself. Take that, Windows 8 UI design.

$3, www.startisback.com

HIGHLIGHTS

- Slick, smooth, and problem-free re-creation of the Windows 7 Start Menu.
- Tons of configuration options.
- You'll have to download a new Start Menu orb if you're not a big Ireland fan.



PAIDWARE

RETROUI PRO

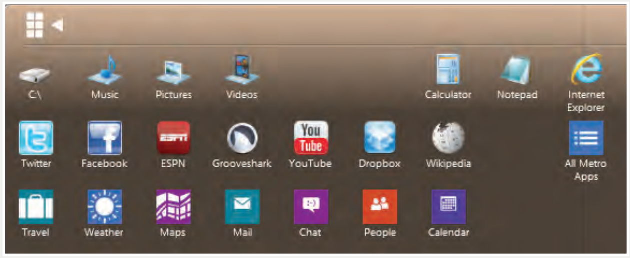
More features than a standard Start Menu

We like the look of RetroUI Pro, but some of its raw functionality—and default configurations—leave a little to be desired.

HIGHLIGHTS
- Plenty of customization.
- Built-in "ModernUI" Start Menu skin is downright atrocious; stick with Windows 7.
- TabletView gives you more of a visual, Modern-like shortcut list for launching apps.

For starters, we hate this Start Menu's "pinning" feature, which requires you to click into a separate "edit mode" to sticky your most-used apps to your Start Menu. A simple, ever-present "pin" icon could have solved this bit.

We also think it's weird that Modern apps appear by default within your Start Menu's All Programs listing, a feature you can thankfully switch off within RetroUI Pro's settings.



You can also configure away Modern's hot corners, but you can't specify which you'd like to toggle on or off—it's all or nothing. At least RetroUI Pro really lets you tweak the links that appear on the Start Menu itself.

Additionally, RetroUI Pro's "Enforce" technology does a great job of sticking your taskbar to the bottom of the screen when you run Modern apps.

$5, http://retroui.com

PAIDWARE

START8

Good looks meet powerful customizability

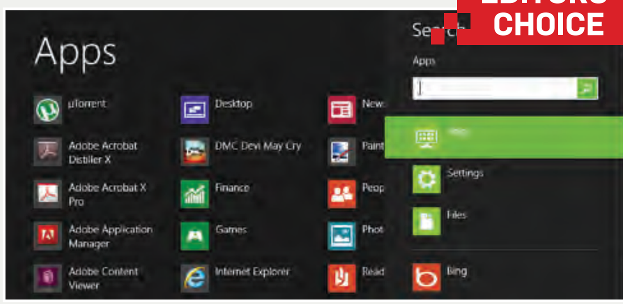
As far as looks go, Start8 presents a very convincing replica of the Windows 7 Start Menu with a few fun twists. First up, switching between that and a Windows 8–themed start menu—a mini-Modern, as it were—is super-easy to do within Start8's simple configuration app. It's as easy as changing the skins on the Windows 7 Start Menu, and you get five of those to choose from.

HIGHLIGHTS
- Powerful functionality (and multi-monitor options).
- Adding Start Menu shortcuts to custom locations on your system is a breeze.
- No way to sticky your taskbar to the bottom of Modern.

As an aside, we love how all of your configuration changes occur in real time within the Start Menu—super-useful for testing out particular settings.

Start8 allows you to customize the various shortcuts that appear on the right side of the Start Menu, including adding shortcuts to any custom locations you want. You can set how you want your Windows Key to work and how Modern's hot corners should run and, yes, Start8 lets you boot right into Desktop Mode, as well. Delightful!

EDITORS' CHOICE



$5, www.stardock.com/products/start8

PAIDWARE

STARTMENUPLUS8

This isn't a Start Menu; this is a punishment

The official website of StartMenuPlus8 looks a bit like a cross between a newbie Geocities site and a seizure, and we're glad to see that the app itself follows suit—consistency's important.

HIGHLIGHTS
- Ugly
- Impractical
- We'd rather stick with Modern.

The Start Menu button that StartMenuPlus8 creates on your taskbar is just a standard pinned application. You have to drag it over to the leftmost slot on your taskbar to mimic a start button and, even then, you get no way to disable Windows 8's hot corners within the app.

It's hard to describe just how strange this app is, from its less-than-pleasing white-on-black color scheme; to its absurd amount of white space within the Start Menu itself; to the absurd level of unnecessary, difficult-to-parse detail packed into its single configuration window. You can't fire up the Start Menu and start typing out a search, and some of the app's own shortcut names don't even fit on its Start Menu screen. Yuck.



$5, www.winok-msixray.com

FIVE OTHER WAYS TO TWEAK WINDOWS 8

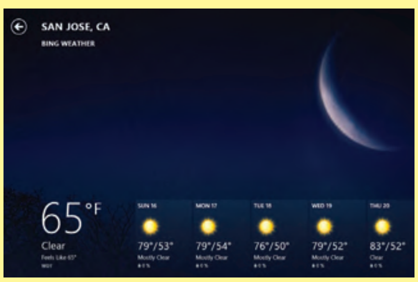
If you want to spruce up the look of the rest of your operating system, we've got you covered!

It's been a year and change since the launch of Microsoft's Windows 8 OS, and it feels as if there's still a dearth of apps for tweaking the operating system proper—besides all of the aforementioned Start Menu programs, of course. Still, we've identified five apps that do a pretty great job of making Windows 8 prettier, at the very least, and in some instances add new functionality that will enhance your new Modern lifestyle. Now that you've souped-up your Start Menu, it's time to tackle the rest of the OS!

MODERNMIX

If you can't stand the full-screen takeover brought on by the Modern portion of Windows 8, then ModernMix is worth the cost of lunch. This super-useful app allows you to run Modern apps as if they were standard applications, run in standard windows, right from Windows 8's Desktop Mode. You can customize the size of the Modern apps themselves—in case you need a huge weather display, but just a tiny window for Skype—and you can pin them to your taskbar for easier access from your conventional desktop.

$5, www.stardock.com/products/modernmix



DECOR8

We're big fans of those grayscale Windows 8 "wallpapers" for Modern's Start screen—and no, we're not being sarcastic. Even though they look a bit like someone pulled up their favorite Photoshop brush and went to town for a few minutes, they do add a pleasant aesthetic to Modern's tiled interface.

But you know us—we like customization. The app Decor8 unlocks the ability to turn any background you want into a wallpaper for your Start screen. You can randomize the backgrounds to set intervals if you want your Start screen to always look new and fresh, and the app will even automatically select a new color scheme for your tiles based on the colors of the background image you've selected.

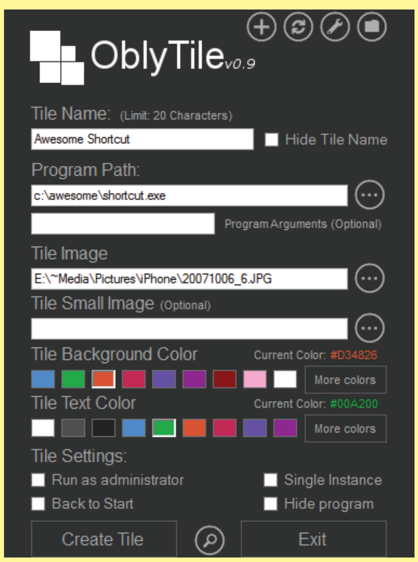
Yes, the Windows 8.1 preview adds this functionality, but it could be an interim solution while you wait for the final version.

$5, www.stardock.com/products/decor8

OBLYTILE

If there's one thing we especially detest about Modern's interface, it's that system tiles and downloaded apps get all the eye candy and our poor, simple shortcuts get ignored. The freeware OblyTile doles out a little love for your ugly-looking shortcuts by giving you the opportunity to customize them with their own thumbnail image, background color, and text color. Who needs Modern's tile-grouping functionality when you have *color coordination*, anyhow?

Free, http://oblytile.en.softonic.com



CHAMELEON

The customization continues! Now that we've successfully freshened up the look of your Start screen, it's time to give your Lock Screen a little bit of love—assuming you haven't already used Windows 8's Group Policy Editor to bypass the Lock Screen entirely. Chameleon, found via the Windows Store, isn't the most intuitive of Modern apps. However, what it lacks in instruction, it makes up for in comprehensiveness.

Using the app, you can have Windows 8 automatically update your Lock Screen's background at set intervals and using a number of images from your computer's photo library or various online sources—including NASA's Astronomy Picture of the Day and Bing's Picture of the Day, to name a few.

Free, Windows App Store



ULTRAUXTHEMEPATCHER

This one's simple. If you want to be able to install third-party themes within Windows 8 (as in, community-created themes instead of those bestowed from Microsoft directly), you're going to need to patch your operating system with this simple tool. UltraUXThemePatcher is free, it's fast, and it even backs up the original files it overwrites in case you need to uninstall the utility for some reason.

Free, http://ultrauxthemepatcher.en.softonic.com

iFixit presents:

AUTOPSY

THIS MONTH WE DISSECT...

Oculus Rift



About iFixit

iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.



BACKGROUND:

The Oculus Rift promises gamers a virtual-reality experience that will make all other "immersion" tactics seem, well, one-dimensional. The wearable display with head-tracking isn't available for consumers yet, but we took apart a developer edition to get a gander of what's inside.

MAJOR TECH SPECS:

While not much is known in terms of tech specs, here's what we've gathered so far:

- Resolution of 1280x800 pixels, 640x800 per eye
- Horizontal field of view greater than 90 degrees
- Diagonal field of view greater than 110 degrees
- Head tracking accomplished with 1,000Hz absolute 9DOF orientation sensor (includes gyroscope, accelerometer, and magnetometer)
- Control box for connecting Oculus Rift to a PC

KEY FINDINGS:

- Separating the display from the strap assembly requires just a Phillips #1 bit. (Does the fact that this isn't the final production have anything to do with it being easy to take apart? Perhaps—only time will tell.)

- After easily separating the two sides of the lens cowling with a plastic opening tool, we get our first unobstructed look at the 1280x800 LCD.

- A couple of clips and some sticky foam adhesive hold the display securely into the front panel of the Oculus. Disconnecting one cable from the display assembly allows complete removal of the Innolux HJ070IA-02D 7-inch LCD.

- The final component out of the headset is the Oculus Tracker V2 board, custom designed and optimized for a 1,000Hz refresh rate. Here we find the chips controlling the revolutionary head-tracking device: STMicroelectronics 32F103C8 ARM Cortex-M3 microcontroller with 72MHz CPU; Invensense MPU-6000 six-axis (gyro and accelerometer) motion-tracking controller; A983 2206—we suspect this is a three-axis magnetometer, used in conjunction with the accelerometer to correct for gyroscope drift.

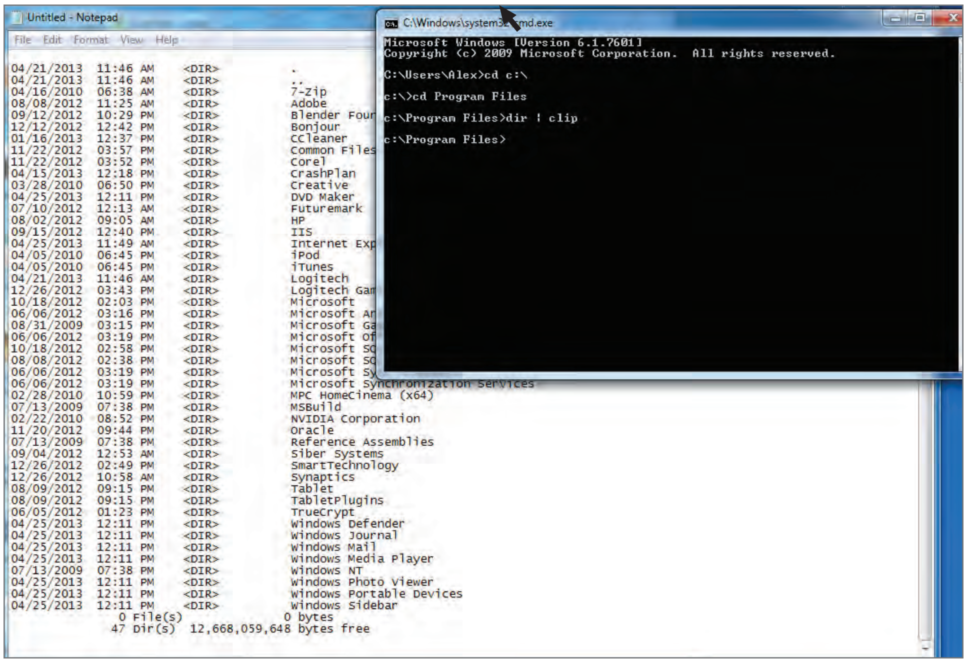
- The Development Kit control box is pretty basic, consisting of buttons for adjusting the Rift's settings and a handful of I/O ports. It opens up after removing four Phillips #1 screws and reveals a Realtek RTD2486AD display interface controller, Winbond W25X-20CL 256KB serial flash, and Techcode TD1484A synchronous rectified step-down converter.

- The Oculus Rift Development Kit Repairability Score: 9 out of 10. Standard Phillips #1 coarse-thread screws are used in both the headset and control box, making them a cinch to open; standard clips around the perimeter make separating the front panel pretty easy; the entire device can be taken apart in less than 10 minutes.

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

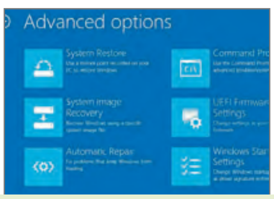
WINDOWS TIP OF THE MONTH



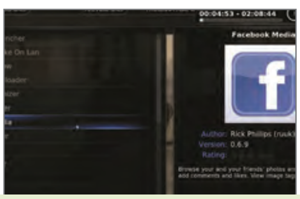
PIPE COMMAND LINE OUTPUTS DIRECTLY TO YOUR CLIPBOARD

Here's a bit of command-line wizardry you might not have heard about: When using the command line, add the string **| clip** to the end of any command. When the command is executed, any text output will be placed directly in your clipboard, allowing you to paste it into an email, a forum post, or anywhere else you'd like.

MAKE - USE - CREATE



64
Downgrade to Windows 7



66
Watch Live TV with XBMC



ALEX CASTLE
CONTRIBUTING EDITOR

WINDOWS ON A HIGH-DENSITY DISPLAY

IT MAY DISMAY some long-time readers to hear that this month my long-simmering preference for the iPhone has finally boiled over—I got a 15-inch MacBook Pro with Retina Display. Hopefully, it'll be some solace to know that the first thing I did was install Windows 8 on the poor thing, in a partition taking up a solid two-thirds of the 512GB SSD. After using it for a few weeks, I've got a few thoughts about Windows on a pixel-dense display:

> Every icon is too small. Anywhere you're allowed to increase icon size, you'll want to.

> Sometimes, you can't increase icon size. There, you'll need to use Windows' magnification settings (search for them in the Start screen) to blow up the user interface.

> Sometimes, the Windows magnification tool screws up the program's UI or formatting. If that happens, you'll have to turn down your display resolution, wasting a perfectly good Retina monitor.

Here's hoping for better high-resolution support in the next version of Windows.

↘ submit your How To project idea to: comments@maximumpc.com

Downgrade to Windows 7

YOU'LL NEED THIS

A WINDOWS 7 INSTALL OR RESTORE DISC

If you bought your PC from a vendor, this should have been included in the box.

AN EXTERNAL HARD DRIVE

You need someplace to store all your data while you're re-installing Windows 7 on your main partition. A USB hard drive, NAS, or jumbo-size thumb drive should do.

WINDOWS 8 takes some getting used to, with its new Start screen and emphasis on full-screen apps. If you've tried your hardest to adjust to the changes with no success, you may be pining for something more familiar.

The good news is that—with a little work—you can downgrade your PC back to Windows 7. As long as you have a Windows 7 install disc (either from Microsoft or from your system vendor) you can follow the step-by-step guide below to ensure that no data or settings are lost.

The guide will work with computers that have been upgraded to Windows 8 from Windows 7, and brand-new PCs where Windows 8 was pre-installed, although there may be some hardware incompatibilities with the latter. Check with your manufacturer for more details. –NICK PEERS

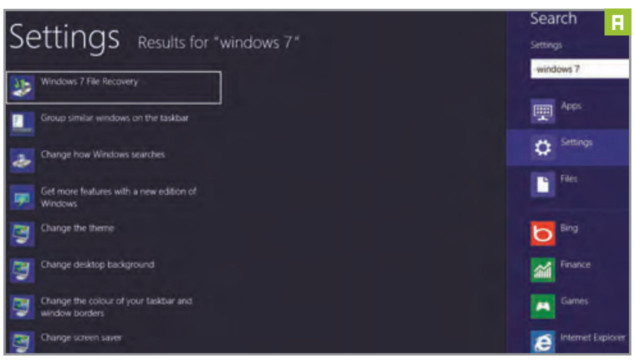
1 PREPARE TO DOWNGRADE First, make sure you have everything you need to install Windows 7. You'll need a Windows 7 install disc, or the recovery disc that came with your Windows 7 system. If you've lost yours, you may be able to purchase replacement discs from your PC's manufacturer.

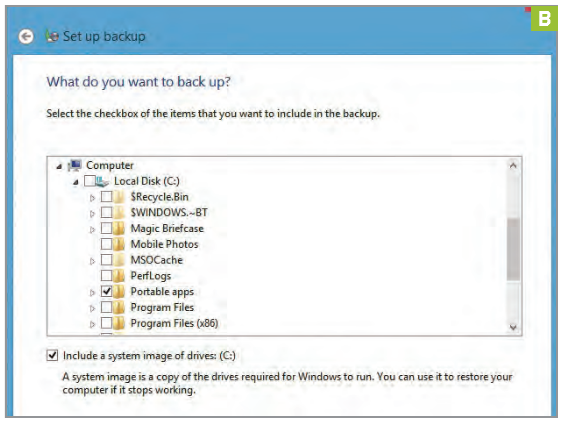
» You'll also need a large external hard drive onto which you can copy your Windows 7 drivers and program files, and where you can save your backup and fail-safe drive image. Remember, downgrading to Windows 7 will wipe everything from your computer's internal drive, so it's important to make a backup of everything you want to keep.

» Windows 8 includes the same backup tool found in Windows 7, so we'll use this. Move your mouse cursor to the top-right corner of your screen (or swipe from the right-hand side if you have a touchscreen) to access the Charms bar. Select the Search charm and type Windows 7. Select Settings > Windows 7 File Recovery to access the backup tool (**image A**).

» Select "Set up backup" and wait a moment. When Windows prompts you, leave your backup device selected and click Next. The default option Let Windows Choose should cover most people's needs. If you want to see what's being backed up or specify nonstandard folders to be included in your backup, select Let Me Choose instead (**image B**).

» Whatever choices you make, review the summary and click "Save settings and run backup." Leave Windows to back up your files and create a fail-safe system image. This might take a while, so be patient! If you don't have a Windows 8 installation disc, create a system restore disc just to be on the safe side. You might decide to go back to Windows 8 at a later date.

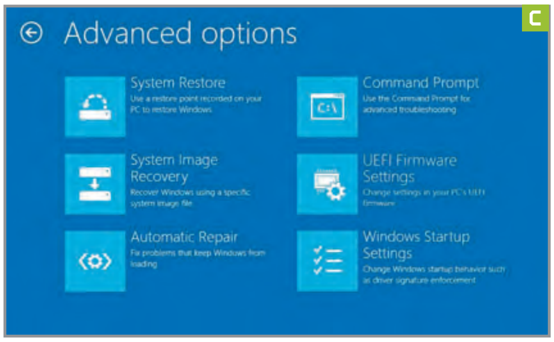


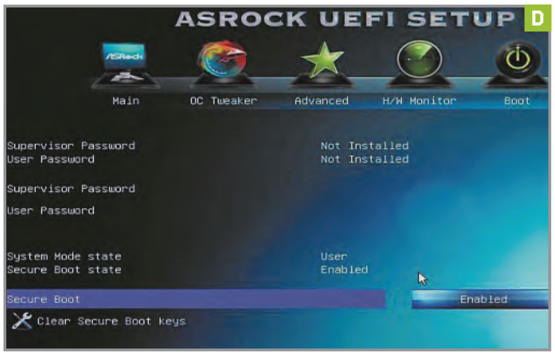


2 TWEAK YOUR BIOS The moment of truth is finally here. Insert your Windows 7 installation or recovery disc in your PC's drive. If you're using a new computer that came with Windows 8 preloaded, you need to make a few changes in your BIOS to configure it to work with Windows 7. If your PC is older and you upgraded it to Windows 8 yourself, you can jump straight to the next step.

» If your PC came with Windows 8 installed, you'll need to tweak a few BIOS settings before you begin installing Windows 7. To do this, select the Settings charm and click Change PC Settings at the bottom. Select General and click Restart under Advanced Start Up. Now select Troubleshoot > Advanced options > UEFI firmware settings (**image C**) and click Restart again.

» Once your computer has restarted, it will display the UEFI settings page with all the settings required (**image D**). First, make sure Secure Boot is disabled. You should also consider setting CSM to Enabled and Fast Boot to Disabled. If these options don't appear, contact your PC manufacturer for assistance. Once you're done, save your changes and exit.

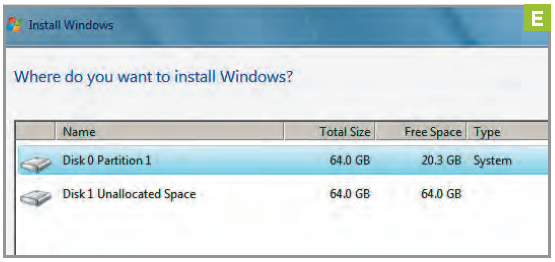




3 **REINSTALL WINDOWS 7** Now, restart your computer with the Windows 7 CD inserted in the drive and—when prompted—press any key to boot from CD or DVD. From this point the process will be different depending on which sort of discs you have. If you're reinstalling Windows 7 from recovery discs provided by your PC's manufacturer, the process will be different from the usual Windows installation. Look for a full, destructive recovery option that erases your hard drive completely and select that. Once reinstallation is complete, you should be able to jump ahead to step 4 to finish the process.

» If you're installing from the Windows disc, just go through the normal, brief Windows installation process. When given a choice of install types, select Custom (advanced). Select Drive Options (advanced), then click Disk 0 Partition 1. Finally, select Format followed by OK to wipe the drive before reinstalling Windows 7 (**image E**).

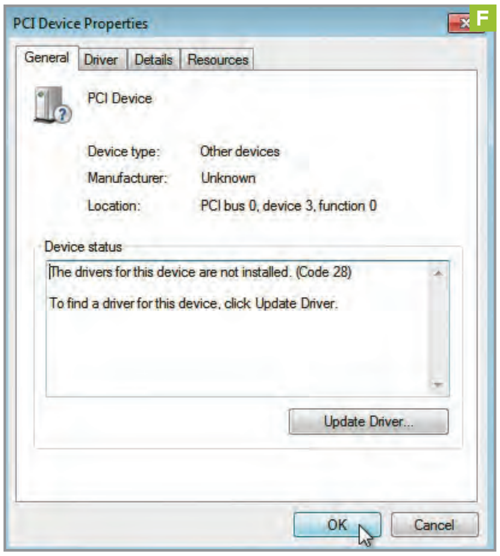
» Make sure the formatted drive is selected, then click Next and wait a few moments while Windows 7 is installed on your PC. After the first restart, you might be asked whether you want to boot from a CD or DVD—don't do this. Follow the setup wizard all the way through, entering your product key when prompted before completing the installation.



4 **RESTORE YOUR DATA** Once you find yourself at the familiar Windows 7 desktop, press Windows key + R, type **devmgmt.msc**, and press Enter to see which drivers are missing from your newly restored system (**image F**). Reinstall those stored on your backup device. If any of them don't work, contact your computer's manufacturer to check for any known compatibility issues.

» After you've reinstalled all your drivers and programs, type **backup** into the Start Menu's Search box and select the option "Restore data, files or computer from backup." Now choose "Select another backup to restore files from" and follow the wizard all the way through, choosing "All files" and "In the original location" when prompted to restore data and settings.

» And that's about it. If you experience any problems during the process, restart using the rescue disc you created earlier, choose Repair Your Computer, and select the option to restore your computer using a system image to recover Windows 8.



Organize Your Media and Watch Live TV with XBMC

YOU'LL NEED THIS

XBMC
Get this excellent media front end for free at www.xbmc.org.

NEXTPVR
This live TV back end can hook into XBMC. Get it at www.nextpvr.com/downloads.

DON'T BE PUT off by the name Xbox Media Center (XBMC)—you don't need a game console to use this fantastic free media software.

XBMC is almost a decade old now, and in that time many tools and handy extras have been developed for it. You can watch YouTube and network videos without having to use Internet Explorer, listen to music through services such as GrooveShark and Pandora, and watch the latest trailers with a dedicated add-on.

Any commercial videos or music on your computer are automatically updated by scrapers, which scour the Internet for information and artwork. This makes organizing your media nice and easy, and gives you a visual guide whenever you play a song or watch a movie.

There are hundreds more features in XBMC, including the ability to record live TV and downloadable remote control apps for Windows Phone devices. It's incredibly powerful and customizable, as well as being easy to use. We'll show you how to get started. –HENRY WINCHESTER

1 DOWNLOAD AND INSTALL XBMC To install XBMC, visit www.xbmc.org and click Downloads at the top of the page. Click Get XBMC and then choose Windows. When prompted to run or save the program, select Run. The XBMC setup wizard will begin. Click Next, agree to the terms, and then de-select anything you might not need on the next screen. Click Next twice more, then click Install.

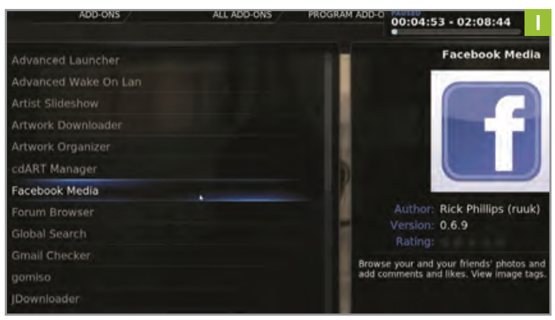
» Once the installation process is complete, click Finish and XBMC should start automatically. You may be prompted to unblock Windows Firewall—click Allow Access if necessary (**image G**). You'll now be presented with XBMC's homepage. You can navigate the bar using the scroll wheel on your mouse, the cursor keys on your keyboard, or the arrow keys on a Windows media remote control.



2 ADD MEDIA SOURCES AND ADD-ONS Click each section to add relevant media. To add photos, click Pictures, then choose Add Source. From here click Browse (**image H**) and then find the relevant folder containing your pictures—My Photos, for example. Click OK when you're ready. Now, you'll be able to browse through your pictures, using the cursor keys or mouse to move forward and back.

» Add-ons are the lifeblood of XBMC, allowing access to more features and functionality. Hover over Videos, then choose Add-ons. Click Get More and you'll see an array of different services (**image I**). Once you've found one of interest, click Install. When it's installed, go back to the homepage, click Add-ons again, and click the new add-on to view the content.





3 **WATCH LIVE TV** The one thing that Windows Media Center did really well was enable you to watch and record live TV, and you can do the same in XBMC. In order to do this, you must first have a TV tuner either installed in your PC via PCI or attached externally via USB. Then just connect a TV antenna to it—you're ready to begin the process of watching and recording live TV.

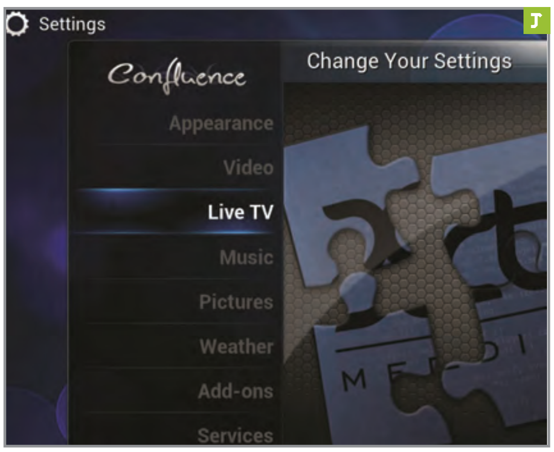
» You need to install the NextPVR back-end, which enables live TV to beam through the XBMC interface. Start by downloading it from www.nextpvr.com/downloads. Once it's open, right-click the interface, choose Settings > Devices, and choose your TV tuner from the list, then hit Configure > Scan to find available channels.

» Now, return to XBMC, go to the main menu (click the Home button if you're not sure where to find this), and select System > Settings. In the left-hand menu, hit the Live TV option (**image J**). In the menu that appears once you've done this, click the General option. By default, TV is disabled in XBMC, so hit the Enabled setting to activate it (**image K**).

» Once you've enabled the TV facility, XBMC displays a message telling you that the PVR manager has been enabled but there is no PVR add-on installed, so click OK to be taken to a list of PVR clients, which will enable you to watch and record live TV. There are lots to choose from, but we've gone for NextPVR PVR client, so click this to get started (**image L**).

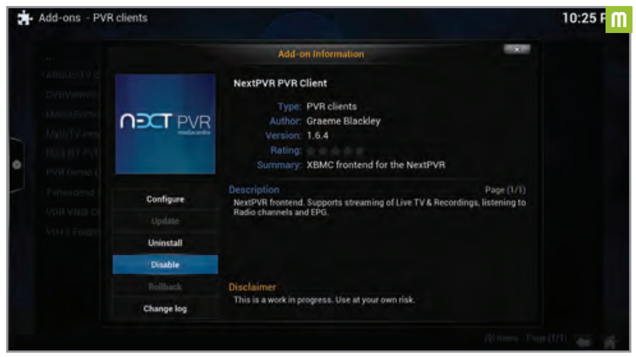
» Once you've selected this, a new window appears, giving you more information about the client (**image M**). To get NextPVR working, hit the Enable button in the list of options to the left. You can click Configure to change some of the other settings, but there's no need to make any major alterations to the standard setup before you start watching TV.

» That's it. When you go back to the main menu in XBMC, you'll see that a new option has appeared called Live TV. When you hover your mouse over this, another menu appears, giving you the option to watch TV channels, look at your EPG (episode guide), and even record broadcasts at specific times. There's no need for Windows Media Center after all! ⏻









BUILD IT

TOM MCNAMARA **ASSOCIATE EDITOR**



Dream Machine's Mini-Me

Not everyone can afford to build their very own Dream Machine, so this month we created a scaled-down version that's half the size, but still packs one hell of a punch

LENGTH OF TIME: **2–4 HOURS** | LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION A few months ago, we made the decision to use Corsair's towering 900D case for the Dream Machine, and we knew we wanted to complement it somehow with the Build It in the same issue. When the 900D's little bro, the Corsair 350D, arrived in our offices a few weeks later, a plan started to form. About the same time as the case arrived, we also received Nvidia's GeForce GTX 700-series cards. With those, plus a new Haswell CPU already in the Lab, the plan became fully realized: We'd just make a smaller version of the Dream Machine. The 350D wouldn't take a full-size motherboard, but we could still pack it with full-size badassery like dual Nvidia GTX 780 cards, an unlocked Intel Core i7 CPU, a primo mATX motherboard (they do exist), a jumbo radiator, and other tasty accoutrements. Our goal was to build a rig that can game to the hilt just like the Dream Machine—only scaled back so it's easier to assemble and a lot easier on your credit line.



NOT THE SIZE OF THE BOAT

YOU'RE NOT hallucinating. We really did get a custom beige paint job for the 350D that mirrors the 900D used in our Dream Machine. It's not just some plastic shroud either, but very high-quality automotive-grade work, courtesy of Smooth Creations. The caliber of the work doesn't show up that well in these photos, but trust us, it's impressive in the flesh. Possibly even more impressive is the fact that even though it's a microATX tower, the case has a combination of features that we're used to seeing in much larger cases, like space for a 280mm radiator, removable drive cages, a 14cm intake fan, rubber grommets for cable routing, and a dust filter under the power-supply mount.

On the mobo side of things, we needed one that was just like our case—smaller than normal but able to hold a ton of hardware, so we called in Gigabyte's G1.Sniper M5. It's a microATX board, but able to handle three GPUs, liquid cooling, and plenty of storage. Since the Dream Machine is rocking GTX Titans, its bambino got the next-best thing: a pair of EVGA GTX 780 GPUs with the non-reference "ACX" coolers. We finished it off by strapping a massive 280mm NZXT Kraken X60 water cooler to the Core i7-4770K to see how much we could overclock it. Powering the whole shebang is an 800W Cooler Master Silent Pro Gold, to which we've also hooked up a 512GB OCZ Vector solid-state drive, a 2TB WD Caviar Black, and two Noctua case fans. For RAM, we went to Mushkin for a pair of 8GB "Ridgeback" sticks that are rated for 2,133MHz.

INGREDIENTS

	PART	PRICE
Case	Corsair Obsidian 350D	$100
PSU	Cooler Master Silent Pro Gold 800W	$160 (street)
Mobo	Gigabyte G1.Sniper M5	$210 (street)
CPU	Intel Core i7-4770K	$335
Cooler	NZXT Kraken X60	$110 (street)
GPU	2x EVGA GeForce GTX 780 3GB w/ACX	$1,320
RAM	2x 8GB Mushkin Ridgeback 2,133Mhz	$150 (street)
SSD	512GB OCZ Vector	$550 (street)
Hard Drive	2TB WD Caviar Black	$150 (street)
OS	Windows 8 64-bit	$100
Total		$3,185

1 THE SEVEN SEAS

WE RECENTLY SNAGGED an Intel Core i5-4670K Haswell CPU, but this "mini Dream" rig called for the upgraded Core i7-4770K, which has Hyper-Threading (HT), a larger L3 cache, and slightly higher clock speeds. Games don't make much use of HT, but it's handy for encoding HD video, streaming live video from your PC, or running virtual machines. Haswell uses the new LGA1150 motherboard socket, which is incompatible with the LGA1155 CPUs used in the previous generation, but the insertion holes in the motherboard are exactly the same, so older CPU coolers will bolt right on with no problems. The Kraken X60's support ring didn't line up totally square on our motherboard, so the slightly rotated look is normal.



2 THE ENGINE ROOM

WHEN WRITING DOWN our wish list for this project's mobo, we scrawled the following: a Z87 chipset, microATX form factor, full SLI support with 8x PCIe lanes for each slot, and respectable overclocking. That made our list pretty short, and right at the top was the Gigabyte G1.Sniper M5. The Sniper series has been around for several years, and the "M" in the name designates the microATX version, since there's an ATX version, too. The Sniper series in general has built a reputation for stability, features, and high performance, and is one of the most popular boards for overclockers who like to build small, tidy rigs.

Despite its smaller dimensions, the M5 doesn't lose much in the way of features, as it still offers Creative Labs sound with isolated circuitry to reduce background noise, a headphone amp, three PCI Express slots for two-way SLI and CrossFire, power and reset buttons on the board itself (pictured), fat heatsinks, six SATA 6Gb/s ports, eight-phase voltage regulator modules, five fan headers, and four digital display outputs.



3 STOWING AWAY

SINCE OUR GOAL is maximum horsepower, we wanted a kick-ass SSD, but one that didn't appear in the DM itself. So, we went with an OCZ Vector 512GB since it's blazing fast and regularly does battle with the Samsung 840 Pro. We also went with a WD Caviar Black 2TB drive for data storage since we like its speed and long warranty.

The 350D comes with one removable two-tray drive cage at the bottom, and a three-tray SSD cage tucked underneath the 5.25-inch bays. The SSD cage is tool-free—you just slide the SSD in from behind, and it clicks into place (pictured). The area between the drive cages is empty to leave room for extra-long GPUs.



4 DOUBLE HULLS

THE NVIDIA GEFORCE GTX 780 is a junior version of the GTX Titan; it has two fewer SMX units, no double-precision compute, and 3GB of VRAM instead of 6GB. However, the EVGA version uses a dual-fan design instead of the stock cooler's single fan, which offers slightly better performance. Since this is a Mini Dream Machine, we put two of these cards in the system, and with a good overclock, they should get damn close to Titan-level performance.

The G1 Sniper motherboard has three PCI Express 3.0 x16 slots, and it doesn't seem to care which ones you use for SLI. We went with the first slot and the third slot to provide some breathing room for the first card's intakes. The 350D's bottom drive cage is short enough to provide room for a two-slot video card in the motherboard's third PCIe slot. Finally, we added a blue SLI bridge to give the interior a little color.



5 AN OLYMPIC GPU

THE CORSAIR 900D is a little over 27 inches high, a bit more than 25 inches long, and about 10 inches wide. The 350D is about 17 inches high, 17 inches long, and 8 inches wide, roughly one-third smaller overall. Despite the shrinkage, it will fit a 280mm radiator at the top, so we installed a Kraken X60. We also replaced the stock Corsair AF120L fans because we had two beige Noctua fans that mirrored the aesthetic of our custom paint job, and the Noctuas move a lot of air silently. We also added a chrome grill to the rear fan, to reinforce the retro look.

Because of its smaller dimensions and reduced weight, the 350D was easy to lift and rotate during the build. You do that a lot when routing cables around a case. Unfortunately, the motherboard tray's cable grommets are surprisingly narrow, making it a tight squeeze for the 24-pin power supply cable, but we got it to fit just barely. The radiator also blocked the grommets above the motherboard tray, which hampered our cable-routing efforts somewhat, making the interior wiring a bit more messy than we would have liked it to be.



6 NAVAL POWER

WE HAD TO INSTALL the 280mm radiator with the tubes coming through the 5.25-inch drive cage, because going the other direction would not have left enough room to keep the rear fan, and we needed it to move some air around the CPU socket. We removed the rubber grommets that came pre-installed in the radiator's screw holes on the top of the case, because they made the X60's installation screws too short. Also, four of the eight mounting holes on top of the case allow for both 15mm and 20mm fan spacing for large radiators. We installed the fans between the radiator and the exterior of the case, in an exhaust/pull orientation. That's what NZXT recommends, and we've found that it works well in smaller cases.

We went with an 800-watt Cooler Master Silent Pro Gold in this build because it's a high-caliber unit that offers more than enough wattage and would let us overclock. We did have to install the 8-pin CPU power cable before the radiator, otherwise the hole above the motherboard would have been blocked. The PSU has a second 8-pin CPU power cable that we didn't need, and it was a little tricky to tuck it away in a microATX case.



1. The Kraken X60's radiator is 12 inches long. With its two fans attached, its two inches thick, and just barely fit in the 350D.

2. The two GeForce GTX 780s were overclocked about 200MHz, bringing them within spitting distance of GTX Titans, but they stayed under 80 Celsius under full load.

3. With this motherboard, you don't have to sandwich two cards together for SLI or CrossFire. Using the third PCIe slot also makes the lower card easier to remove.

4. You just need to press on the lower panel of the front bezel to pop it open to swap fans or clean the filter; unfortunately, the panel isn't removable, which made our fan swap difficult.



DREAM A LITTLE DREAM

THIS SYSTEM SHOWED us that we're finally getting to the point where we can build a machine that challenges our zero-point system without taking out a bank loan or causing blackouts in the vicinity of the office. This is in part thanks to steadily improved drivers from Nvidia, but also because the GTX 780 is a relatively affordable card given its performance. The dual-GPU GTX 690 in the zero-point is still the fastest single-GPU card available, but this system's dual GTX 780s were a lot faster in all of our tests. We didn't have any trouble staying around 60fps at 2560x1600 in benchmarks like Hitman: Absolution, the new Tomb Raider, and Heaven 4.0, even with all settings totally maxed out.

Also of interest this time around is that we saw Intel's new Haswell CPU architecture not only catch up to the Sandy Bridge-E used in the zero-point, but surpass it on occasion. However, the zero-point's Core i7-3930K is not overclocked, and we had cranked the Core i7-4770 up to 4.5GHz to get on the same playing field as a 12-core 3930K running at 3.2GHz. On the bright side, the Kraken X60 never got noticeably loud or hot, hitting just 70 C under full load at 4.5GHz.

As far as the build itself goes, we'll admit that the reduced amount of room in a microATX case introduced some challenges, especially since we were packing in a full ATX tower's worth of hardware. Despite the one-inch gap between the two GPUs, the lower card was just a couple millimeters above the power supply, which was not ideal for air intake. Power and SATA cables coming out of the SSD cage are difficult to tuck out of the way since they have literally nowhere to go, and a lot of real estate behind the mobo is taken up by the 24-pin power cable and two PCIe cables. We also had to connect the front panel, internal USB headers, and SATA cables to the motherboard before installing the lower video card, because the GTX 780 hid all of those connections.

But overall, we were pleased with the results. The 350D handled SLI and a 280mm radiator without too much trouble. If you build this system, we'd recommend a 240mm or even 120mm radiator though, just to give you room for cable routing and an optical drive if you're into that kind of thing. So yeah, it was a little tough, but this month we weren't going for the easy way out. We wanted dreamy performance.

BENCHMARKS

	ZERO POINT	
Premiere Pro CS6 (sec)	2,000	2,280 (-12%)
Stitch.Efx 2.0 (sec)	831	763
ProShow Producer 5.0 (sec)	1,446	1,215
x264 HD 5.0 (fps)	21.1	19.6 (-12%)
Batman: Arkham City (fps)	76	138
3DMark11 Extreme	5,847	9,568

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

The zero-point machine compared here consists of a 3.2GHz Core i7-3930K, 16GB of Corsair DDR3/1600 on an Asus P9X79 Deluxe motherboard. It has a GeForce GTX 690, a Corsair Neutron GTX SSD, and 64-bit Windows 7 Professional.

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

INSIDE



GTX 770 FACE-OFF PAGE 76



This CFI chassis features mini doors to access the drives.

CyberPower Zeus Evo Thunder 3000 SE

Just call it Zeus

NOT EVERYONE can afford a $16,500 Dream Machine. In fact, not many people could afford even half of what we spent to build this year's Dream rig. Well, actually, most people probably wouldn't even spend a third of that on a new rig.

Enter CyberPower PC's new Zeus Evo Thunder 3000 SE. Or if you prefer, Zeus, Zeus Thunder, or just ZET3KSE, if you're into the whole brevity thing. CyberPower is one of those vendors that has long had us wondering how it could pack so much hardware into a box so cheaply. Example: Purchased full retail, the parts in the Zeus add up to about $2,200. The price of the Zeus with a warranty and support? $2,200.

The Zeus is packing Intel's new 3.5GHz Core i7-4770K overclocked to 4.2GHz. That chip is joined by 16GB of Corsair Vengeance DDR3/1600 and a pair of EVGA Superclocked GeForce GTX 770 cards. The cards and processor are powered by a Cooler Master Silent Pro Gold 1,000-watt PSU.

The enclosure features a CFI-A8007 design that's new to us. Case enclosures tend to be about as different as refrigerators: There's a door on the left and a door on the right. The CFI-A8007 has the typical compartment for the mobo and PSU but, uniquely, the storage section gets its own little swing-out doors. To extend the fridge metaphor, sorry, it's like the little doors that let you reach in to get just the milk. For a medium-size case, CyberPower does a very nice job tucking and hiding the wiring out of sight, too.

One thing we're not so enamored with is the storage config the company picked. The PC comes with a 64GB Corsair Neutron SSD and a 2TB HDD. We thought the SSD was used as a caching drive but CyberPower actually configured it as a stand-alone for the OS. We know you get the most performance that way, but 64GB doesn't go very far, and we'd much rather see caching using the Z87's SRT feature. Configured as such, we ran out of space just running our benchmarks.

In performance, the rig represents well against our zero-point, with its SLI 770 cards amazingly out-doing the single GeForce GTX 690 card our zero-point runs. The Haswell CPU also slams the zero-point's six-core SNB-E in Stitch.Efx and ProShow, but then itself gets slammed in the multithreaded workloads of Premiere Pro and x264—no surprise. Up against something more modern, such as this month's Build It PC, the Zeus is pretty close in the CPU-limited benchmarks. Not so in the graphics department, where the Build It rig is about 26 to 28 percent faster due to its overclocked and SLI'd GTX 780 cards. Of course, there's also a big difference between the two in price, with the Build It pushing $3,700. We'll note, however, that our Build It has the added amenities of a custom paint job and much beefier storage.

And storage is actually our No. 1 ding against the Zeus. The box really should have a larger SSD, or caching enabled. This ultimately hurts its score, but still, we have to give CyberPower props for delivering so much performance at such a good price. –GORDON MAH UNG

VERDICT 8

CyberPower Zeus Evo Thunder 3000 SE

➕ **ZEUS** Excellent price-to-performance ratio.

➖ **LOKI** Storage configuration is confusing at best.

$2,200, www.cyberpowerpc.com

BENCHMARKS

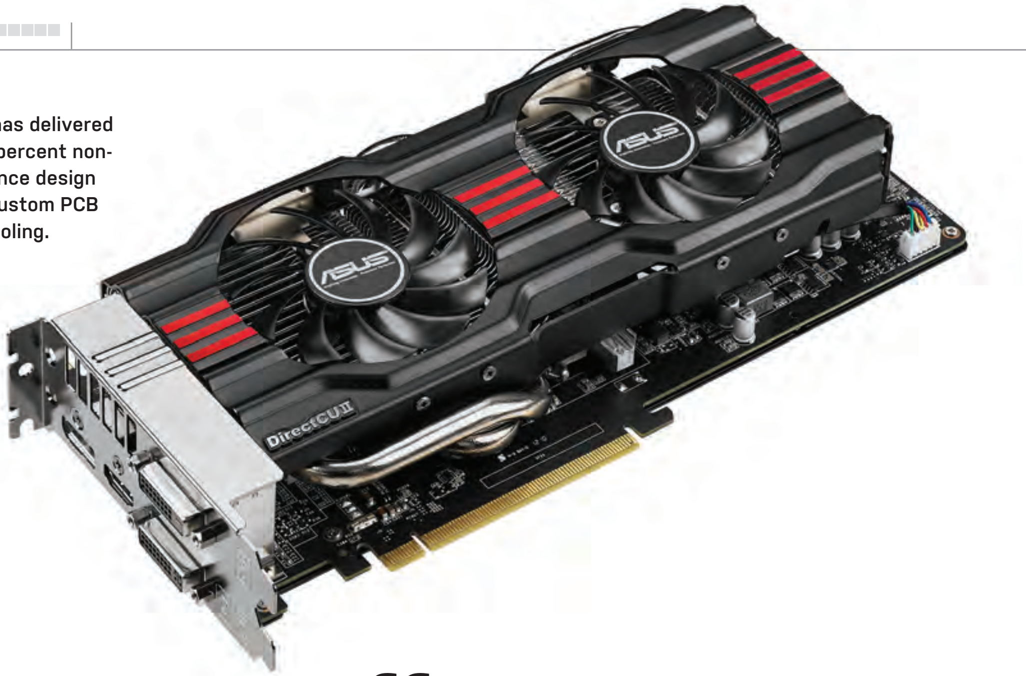
	ZERO POINT	
Premiere Pro CS6 (sec)	2,000	2,317 (-14%)
Stitch.Efx 2.0 (sec)	831	760
ProShow Producer 5.0 (sec)	1,446	1,269
x264 HD 5.0 (fps)	21.1	18.5 (-12%)
Batman: Arkam City (fps)	76	99
3DMark 11	5,847	7,050

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

SPECIFICATIONS

Processor	Intel Core i7-4770K@4.2GHz
Mobo	Asus Sabertooth Z87
RAM	16GB Corsair DDR3/1600
Video Card	2x EVGA GeForce GTX 770 in SLI
Sound Card	Onboard
Storage	64GB Corsair Neutron SSD, 2TB Toshiba 7,200rpm HDD
Optical	LG Blu-ray Combo Drive
PSU	Cooler Master Silent Pro Gold 1,000W



Asus has delivered a 100 percent non-reference design with custom PCB and cooling.

GTX 770 Face-Off

An overclocked and super-cooled silicon smackdown

Last month, Nvidia launched the GeForce GTX 770, and showed us the "stock" board with a GTX Titan cooler. At the time, Nvidia said its add-in board partners would be offering versions that were overclocked and custom-cooled, but we didn't know that was *all* that would be available. As it turns out, spotting a GTX 770 with the Titan cooler is about as rare as seeing Gordon Mah Ung at an Apple store, so kiss your Titan-cooled GTX 770 dreams goodbye for now. The good news is that you're now forced to choose from a flurry of premium-looking cards including these two sweet overclocked and super-chilled boards from Asus and Gigabyte. Both boards feature loads of custom hardware, specialized fans, overclocking software, and totally silent operation. Sounds like the perfect ingredients for a matchup to us! –**JOSH NOREM**

ASUS GEFORCE GTX 770 DIRECTCU II OC

The Asus GTX 770 DirectCU II OC deviates wildly from Nvidia's reference design, replacing it wholesale and saving only the GK104 silicon. Not only is the cooling apparatus entirely new (at least compared to Nvidia's reference cooler), but Asus also uses its own custom PCB with specialized components, including Super Alloy Power (SAP) caps and chokes for more efficient operation and increased longevity, custom VRMs with their own heatsink, and power diagnostic LEDs. Asus even threw in a backplate for better cooling and increased rigidity, too. Despite the cooling assembly's size, you can actually remove the whole thing with just four screws (compared to the stock cooler's 22 screws), allowing for easy spring cleaning. The best part is that all this technology will only cost you a whopping $10 more than the stock card, making it somewhat of a bargain. Also, this is a 2GB card and Asus has informed us it has no plans to bring a 4GB version to market.

Of course, for a $10 premium you shouldn't expect sky-high overclocks, and Asus keeps it real with a mild 12MHz overclock, though that can be pushed much higher (see below). Overclocking benefits aside, the main value of the Asus card is that it's built with top-of-the-line parts and runs cool and quiet. The card is able to achieve this superior cooling performance despite taking up the same dual PCIe slots (the GTX 680 DCII had a three-slot cooler for the same GPU, mind you). Helping you maximize the card's performance is Asus's GPU Tweak utility, which lets you adjust clock speeds, voltages, fan performance, and more. We like GPU Tweak but wish it displayed real-time clock speeds in a more easy-to-read fashion.

In testing, we saw the Asus card eke out a small performance advantage over the stock card, and we ran all tests with the card overclocked, as well. The highest we could get this little puppy was 1,241MHz, and we had to up the voltage to its maximum setting of 1.2V. We thought we'd be able to nudge it up to 1,280MHz or so, but every time we did that it was not stable. However, the most glaring difference is that this card runs very quietly regardless of what's thrown at it. Under load for hours, it held its own with a maximum temperature of 72 C compared to the stock cooler's average maximum of about 80 C. The GPU Tweak software lets you set maximum temp (remember this is a GPU Boost 2.0 card), increase voltage, adjust clocks, and monitor all these settings, too. It's great software, but we prefer EVGA's PrecisionX with its real-time clock-speed display. It's just easier to read at a glance.

All in all, there's very little to complain about here. Yes, it has the exact same performance as Gigabyte's card, both in terms of FPS and silent operation, yet the Asus card costs $10 more. However, the Asus card has better software, isn't quite as long, and its cooler is easy to remove, all of which is easily worth the price bump.

VERDICT 9 KICK ASS!

Asus GeForce GTX 770 DirectCU II OC

$410, www.asus.com



Three slow-spinning fans on GigaByte's WindForce equal silent operation and excellent temps at all times.

GIGABYTE GEFORCE GTX 770 WINDFORCE 3X OC

Like Asus, Gigabyte has pulled out all the stops for its highly clocked GTX 770 and delivered a board that looks nothing like the stock card at all due to its custom PCB and exotic triple-fan cooler it calls WindForce 3X. This big-ass cooler uses three 8cm fans on top of a heatsink roughly the size of Central America, and Gigabyte says it can dissipate up to 450W, making it one of the largest coolers we've seen on a GPU since the triple-fan PowerColor Devil 13 HD 7990 graced the Lab in 2012. That card, if you recall, was so large it came with its own support stand, and though this card isn't in the same ballpark, it's in the same league for sure, but since it takes up just two slots instead of three it seems a lot more manageable. It's also 11 inches long, which is .5 inches longer than stock. Its bundle includes two 6-pin Molex-to-PCIe adapters and a driver CD.

Its cooler is the same one found on the GTX 780, so it's more than up for the task of cooling this card despite its higher clock speeds (compared to the GTX 780's). Gigabyte calls the cooling setup "Triangle Cooling," as there is a triangle-shaped copper heat spreader on top of the GPU with a heatsink on top of that. The fan is then placed on top of the triangle, forcing the air hitting the card to divert onto each side of the triangle. There's a secondary heatsink too, cooling the board's circuitry, but it lacks the triangle apparatus. Again, like Asus's card, this is a non-reference design with high-end components and has Gigabyte's Ultra Durable branding, including the signature two ounces of copper within the PCB to help absorb heat and better control temps. The card is clocked at 1,137MHz base with an 1,189MHz boost clock, and in our testing we were also able to get it up to 1,241MHz, just like the Asus. We also had to nudge the voltage slightly to achieve this, but suffice to say we had the same overclocking success with this board as we did with the Asus card. Given that the cards had similar clock speeds once overclocked, we were not surprised to find them run almost exactly the same in testing. The WindForce 3X had a tiny one-or-two frame advantage in some games, but it's close enough to call it a tie. This brings us to the card's operation, and yes, it was also extremely quiet at all times. Was it quieter than the Asus board? It's hard to say, as they were both what we'd call "silent," even under full load. In temps, the WindForce held steady at 74 C, even when we told the card to run as hot as it likes, and it would not budge over that line. That's seven degrees warmer than the Asus board though, so we're taking away one point for that small transgression.

Our other gripe is with the OC Guru II software, which is not as easy to use as the GPU Tweak program provided by Asus, and takes up *way* too much space on the desktop. That's about it though; out of the box this card is fast, quiet, and the same price as MSRP, representing an incredible value.

BENCHMARKS

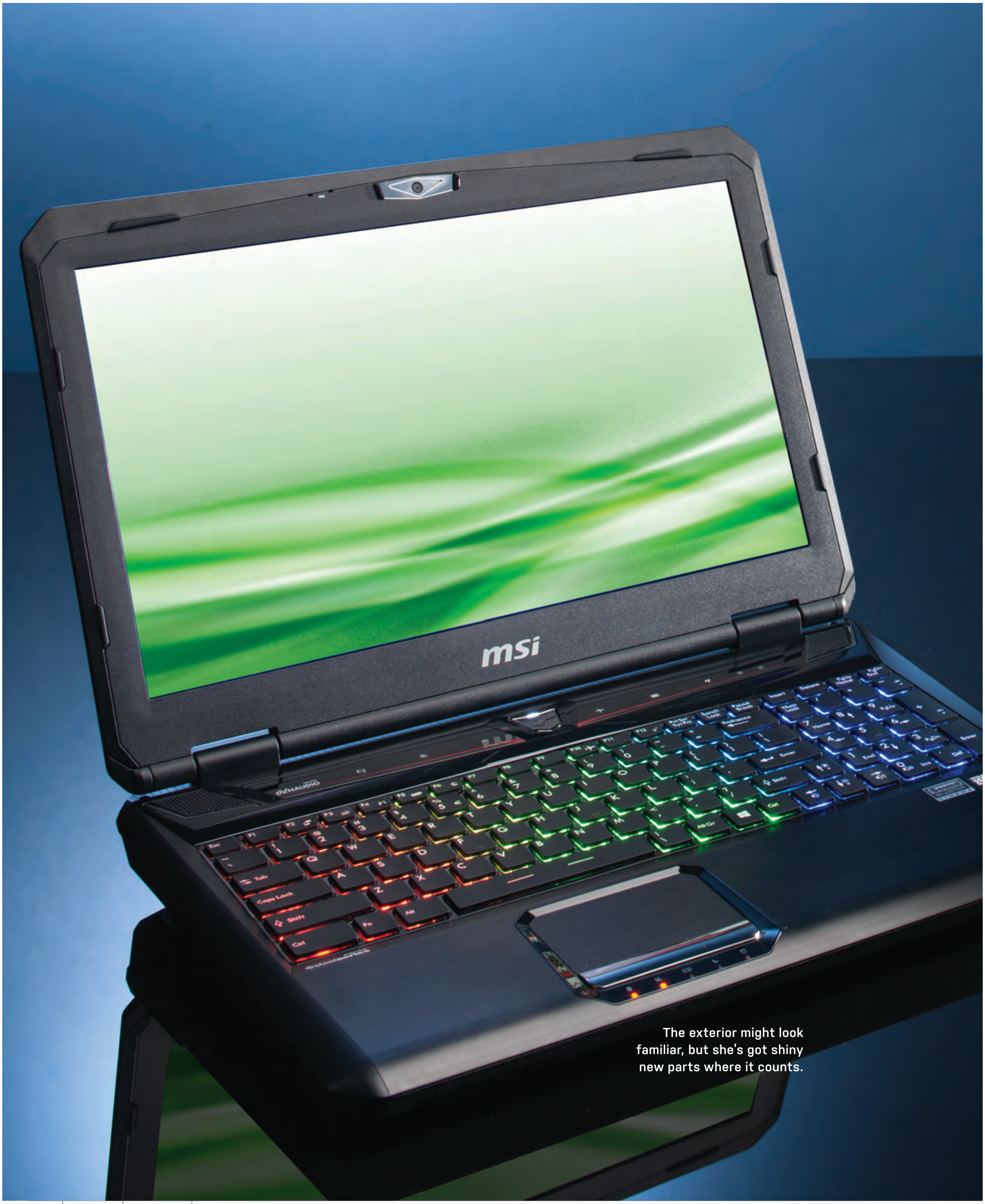
	Asus GeForce GTX 770 DirectCU II OC	Gigabyte GTX 770 WindForce	GTX 770 (Reference)	Asus GTX 680	GTX 670 (Reference)	XFX Radeon HD 7950
3DMark Fire Strike	6,988	**7,290**	6,932	6,456	5,912	6,099
Catzilla (Tiger) Beta	**5,992**	5,978	5,604	5,255	4,907	4,024
Unigine Heaven 4.0 (fps)	25	**26**	24	23	21	20
Crysis 3 (fps)	**25**	21	17	17	16	17
Shogun 2 (fps)	41	**43**	39	38	33	34
Far Cry 3 (fps)	32	**33**	30	30	28	27
Metro: Last Light (fps)	**19**	**19**	17	16	16	12
Tomb Raider (fps)	20	**21**	20	18	16	18
Battlefield 3 (fps)	**40**	**40**	38	34	35	35
Core/Memory Clock (MHz)	1,058/7,000	1,137/7,000	1,046/6,000	1,006/6,000	915/6,000	860/5,000
TDP	230W	230W	230W	250W	170W	200W

Best scores are bolded. Our test bed is a 3.33GHz Core i7-975 Extreme Edition in an Asus P6X58D Premium motherboard with 6GB of DDR3/1333 and an 850TX Corsair PSU. The OS is 64-bit Windows 7 Ultimate. All games are run at 1920x1200 with 4x AA unless otherwise noted.

VERDICT 9

Gigabyte GeForce GTX 770 WindForce 3X OC

$400, www.gigabyte.us



The exterior might look familiar, but she's got shiny new parts where it counts.

MSI GT60

Prodigal son returns... with Haswell and a 780M!

IF THE MSI GT60 looks familiar, that might be because it's identical to our zero-point gaming notebook, which we first reviewed in our December 2012 issue. While the laptop uses the same chassis, the refreshed unit comes with shiny new parts that include Intel's Haswell CPU and a new top-tier 700-series GPU from Nvidia.

In terms of design, the refreshed GT60 features the same brushed-aluminum 15.5x10.5x2-inch chassis as its predecessor. It also comes with the same competent 1920x1080-resolution TN monitor, quality-sounding Dynaudio speakers, capable multitouch trackpad, and multicolored, backlit SteelSeries keyboard. Aesthetically, it's a little garish, but it's far from the ugliest notebook we've seen. The bigger problem is that it weighs nine pounds, 13.2 ounces, which is quite heavy for a 15.6-inch notebook.

Under the hood, MSI has made vast upgrades to the GT60. Our configuration came with a brand-new Haswell Core i7-4700MQ CPU and GeForce GTX 780M GPU, both of which we hadn't had the pleasure of testing before. One of our biggest gripes with the previous GT60 was that it didn't come with a solid-state drive. That issue has been resolved, as our refreshed unit came with a 128GB mSATA SSD that allowed the laptop to quickly boot to Windows in less than 14 seconds. Mechanical storage is handled by a 1TB HDD. If that isn't enough space for you, the GT60 supports up to two additional mSATA SSDs, although opening the bottom of the laptop to access these bays voids the warranty. Another upgrade found in this new GT60 is a bump up to 16GB of RAM, from its predecessor's 12GB. It also has two additional RAM slots, if you'd like to add more. Unfortunately, adding RAM requires cracking open the case and thus technically voiding the warranty, too.

Watching all these components chew through our benchmarks was a joy to behold. Not surprisingly, the CPU gains weren't huge, with the GT60's new Haswell processor beating its older Ivy Bridge counterpart by roughly 11–14 percent. Its biggest lead came in the multithread-loving x264 encoding benchmark. While these performance gains might not dazzle the skeptic, Intel has made some great strides with Haswell's energy efficiency. Looping a ripped Blu-ray movie, the notebook was able to last roughly four hours and 20 minutes, which is about a 40 percent improvement over our zero-point's already competent battery life. The biggest star here, however, is the new GeForce GTX 780M video card. While it still uses Nvidia's Kepler architecture, which we first saw with the green team's 600-series GPUs, it's essentially loaded with a lot more firepower this time around. It's got more than 1,000 more CUDA cores, its memory clock is 1,000MHz faster, and it has a 256-bit memory-interface width compared to the 670M's 192. This all amounts to at least double the performance in our graphics benchmarks.

In our experiential gameplay tests, the GT60 ran Borderlands 2 maxed out at 1080p at around 100fps, proving that this rig should be able to cut through mainstream PC games like a hot knife through butter. Firing up Far Cry 3 for a beefier challenge, the GT60 wasn't able to max the game on the highest Ultra settings, but it did manage silky smooth frame rates in the 50s on Very High with AA turned off, which is very impressive for a laptop.

In terms of performance, the refreshed GT60 is better than its predecessor in every way. We like the laptop a lot, but it still has some issues that prevent it from being completely Kick Ass. While it's not the most expensive notebook we've ever reviewed, it's certainly not cheap at $2,100. We also wish it were sleeker and dropped a few pounds so we could lug it around more easily. Still, if you're seeking great performance from a desktop replacement, this is one fine machine.

–JIMMY THANG

BENCHMARKS

	ZERO POINT	
Stitch.Efx 2.0 (sec)	1,092	968
ProShow Producer 5 (sec)	1,786	1,609
x264 HD 5.0 (fps)	12	13.7
STALKER: CoP (fps)	32.8	67.3 (105.2%)
3DMark 11 Perf	2,979	6470 (117.2%)
Battery Life (min)	187	259

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point notebook is an MSI GT60 with a 2.3GHz Intel Core i7-3610QM, 12GB DDR3/1600, two 500GB Seagate 7,200rpm hard drives, a GeForce GTX 670M, and Windows 8 64-bit. STALKER: CoP tested at 1920x1080 with Ultra settings, Tessellation, and contact hardening.

VERDICT 9

MSI GT60

+ 8800 GT Excellent battery life; good CPU; great GPU.

– GTFO Not cheap; TN panel; same old chunky chassis.

$2,100, www.msi.com

SPECIFICATIONS

CPU	2.4GHz Intel Core i7-4700MQ
RAM	16GB DDR3/1600
Chipset	Intel HM87
GPU	Nvidia GTX 780M
Display	15.6-inch, 1920x1080 TN display (matte)
Storage	1TB (7,200rpm) HDD, 128GB mSATA SSD
Optical Drive	Blu-ray burner
Connectivity	Ethernet, VGA, HDMI, mini DisplayPort, eSATA, 7-in-1 media reader, 3x USB 3.0, USB 2.0, audio in, audio out, headphone, mic, 720P webcam, Bluetooth, 802.11n
Lap / Carry	7 lbs, 10.3 oz / 9 lbs, 13.2 oz

SandDisk Extreme II 480GB SSD

Second swing at Extreme SSD scores a hit

The Extreme II offers relatively extreme performance, but not in all benchmarks.



THE LAST TIME we saw the SanDisk Extreme SSD it wasn't exactly "extreme." It was a fine drive and all, and we awarded it a "what a nice boy" verdict of 8 because it was decent, but it didn't blow off our anti-static leashes or anything. The problem was it was a "me, too" SSD, using 24nm toggle NAND and an LSI SandForce SF-2281 controller, which was all the rage in the ancient SSD era of 2012. Times have changed though, and SandForce isn't the only game in town anymore. SSD manufacturers are now trying to separate themselves from the pack of wannabes by going with different combinations of controllers and NAND flash, and that's the tactic SanDisk has employed this time around by changing both the NAND flash and the controller, making the Extreme II SSD an all-new drive.

At the heart of the new drive beats Marvell's third-generation SSD controller, the 88SS9187 "Monet," released this year and found so far in the Crucial M500 and Plextor M5 Pro SSDs. It offers eight NAND channels and supports up to 1GB of external DDR3 memory (external to the controller, not the SSD). Inside the drive's belly is new 19nm SanDisk toggle NAND, which is also being used by Corsair and Seagate in their newest SSDs. The NAND is rated for 3,000 program/erase cycles, which works out to roughly 80 terabytes written over the course of the drive's life. That's about 40GB of writes per day, which would be considered enough data-writing to warrant an intervention by family and friends. The drive also comes with a five-year warranty—superb—but a fairly bare-bones drive utility that shows you smart values and updates firmware—not superb.

The most unique attribute of the Extreme II is what SanDisk calls Tiered Caching, which utilizes both volatile DDR RAM and non-volatile SLC NAND for cache, instead of just DDR like most SSDs on the market (besides SandForce drives, which never used external cache). The secondary SLC NAND cache helps with small writes, which are common in desktop workloads, as they are written to the SLC NAND in groups at high speed before being written to the MLC NAND, resulting in improved performance. We saw that improvement in our Sony Vegas test, which encodes a 20GB video file to the SSD as fast as it can handle it—the Extreme II completed the test in record time. Its sequential-read and -write speeds were also quite good with compressed and incompressible data, putting it shoulder-to-shoulder with the fastest drives available. It scored surprisingly low in PCMark Vantage, however, and its 32QD IOPS score of 40K-plus was about half what its counterparts could produce, harming the Extreme II's overall ranking. Though the Extreme II isn't quite as fast overall as the Samsung 840 Pro, it is much less expensive, and it's slightly faster than the Corsair Neutron GTX, just not in all tests, making it an overall much-better-than-average drive, but not Kick Ass. –JOSH NOREM

BENCHMARKS

	SanDisk Extreme II	SanDisk Extreme II	Crucial M500	Samsung 840 Pro	Corsair Neutron GTX
Controller	Marvell 88SS9187	Marvell 88SS9187	Marvell 88SS9187	MDX	LAMD
Capacity	480GB	240GB	480GB	512GB	480GB
CrystalDiskMark					
Avg. Sustained Read (MB/s)	521	533	480	**534**	441
Avg. Sustained Write (MB/s)	484	493	422	**514**	478
AS SSD - Compressed Data					
Avg. Sustained Read (MB/s)	508	510	493	**513**	507
Avg. Sustained Write (MB/s)	473	478	408	**495**	475
ATTO					
64KB File Read (MB/s)	503	**528**	502	524	345
64KB File Write (MB/s, 4QD)	462	477	422	**497**	485
Iometer					
4KB Random Write 32QD (IOPS)	42,699	49,850	83,354	82,927	**85,375**
PCMark Vantage x64	38,093	**76,556**	71,619	75,205	67,426
Sony Vegas Pro 9 Write (sec)	**275**	**275**	485	294	286

Best scores are bolded. All tests conducted on our hard drive test bench, which consists of a Gigabyte Z77X-UP4 motherboard, Intel Core i5-3470 3.2GHz CPU, 8GB of RAM, Intel 520 Series SSD, and a Cooler Master 450W power supply.

VERDICT 8

SanDisk Extreme II 480GB SSD

+ **EXTREME** Five-year warranty; very fast; has firmware software.

− **TITANIUM** Below average PCMark score; middling IOPS at 32QD.

$440, www.sandisk.com



In Norwegian mythology, a kraken is a giant sea monster similar to a squid.

NZXT Kraken X60

X marks the spot

IN THE WORLD of enthusiast system cooling, water is the new black. Even the fanciest, biggest air cooler can't seem to keep up with a good closed-loop liquid cooler these days. NZXT ups the ante by expanding from the standard 12cm form factor to 14cm. It may not seem like much, but the increased surface area gets impressive results, especially when the Kraken X60 doubles it to 28cm.

This super-size beast won't fit in most older cases, though. You can check NZXT's website to see if yours is worthy, but it's not a comprehensive chart. There are also two different standards for fan spacing right now: 15mm and 20mm. This is the size of the gap between the screw holes of adjacent fans; 15mm puts the fans right against each other, while 20mm leaves a little space. The X60 is a 15mm cooler. You can't knock NZXT for creating a part that doesn't fit everywhere—it's just something to be aware of before you start flinging your money around.

Installation is pretty breezy. You snap a bracket onto the pump, put some screws into the bracket, and then set this arrangement down on the CPU socket. The bracket captures the screws so they don't fall out during installation. However, the capturing mechanism is difficult to undo if you accidentally insert the nearly identical-looking LGA2011 screws instead of the LGA1150/1155 versions (why vendors can't color-code the screws we don't know). LGA1155/1150 and AMD motherboards get a plastic backplate, which is not ideal; the metal bits you insert into the backplate (to secure the screws you've attached to the pump) could get twisted out of place and strip the hole, making it difficult to install the screws securely. It would be nice to see a metal backplate, like on the similar Corsair H100i. However, it's nice that the screws are designed to tighten abruptly, so you're unlikely to crack the backplate from excessive torque.

As for cabling, it's pretty straightforward. All wires are integrated into the pump, and the fan connectors, USB cable (to communicate with the fan control software), and SATA cable (to power the pump) are long enough for a variety of case layouts. They're even sleeved in classy black braiding. The liquid tubing is also long, flexible, and rubberized.

We discovered right away that the extra size of this radiator and its fans gave us a combination of impressive cooling and impressive noise level. Even with our internal testing tool thrashing the CPU harder than Prime95, the X60 never rose above a moderate drone when set to Silent mode—while holding a 4.13GHz i7-3960X overclock to the mid-60s Celsius. Its dual fans hovered around 975rpm during this test. We could force them up to 1,500rpm by engaging Extreme mode, but it was super loud and only lowered temps by 4 C. There's also a Custom mode where you can chart several points where you want the fan speeds to be at certain temperatures.

Compared to the H100i, it's a tough call; the X60 gets a slight edge for not needing a firmware update (or needing to search Google for one) and having the control software bundled on a CD. Both items make setting up a new computer much easier. But at the $120 level, a metal backplate isn't too much to ask for. –TOM MCNAMARA

VERDICT 9

NZXT Kraken X60

➕ **1967 SHELBY COBRA** Silent mode delivers great temps; smooth installation.

➖ **1983 BUICK CENTURY** Plastic backplate; case compatibility chart has gaps; difficult to disassemble.

$120 (street), www.nxzt.com

BENCHMARKS

	Kraken X60 Quiet / Performance Mode	H100i Quiet / Performance Mode	212 Evo Quiet / Performance Mode
Ambient Air	20.9 / 20.7	20.3 / 20.5	20.5 / 20
Idle Temperature	**29.7 / 28.8**	30.7 / 29.3	35.5 / 30.5
Load Temperature	**66** / 61.8	67.1 / **61**	70 / 67.3
Load - Ambient	**45.1** / 41.1	46.8 / **40.5**	49.5 / 47.3

All temperatures in degrees Celsius. Best scores bolded. All tests performed with an Intel Core i7-3960X at 4.1GHz, on an Asus Rampage IV Extreme motherboard, in a Corsair 900D with stock fans set to Standard.

SPECIFICATIONS

Radiator Dimensions (H x D x W)	1.06 x 12.3 x 5.45 inches
Weight	1.8 lbs
Stock Fans	2x 14cm PWM
Socket Support	LGA1150/1155/1156/1366/2011; AM2/ AM2+/AM3/AM3+/FM1/ FM2
Additional Fan Support	Two 14cm (screws included)

HP Spectre XT TouchSmart

15.6-inch Ultrabook both delights and disappoints

THE SPECTRE XT TouchSmart is HP's *creme-de-la-creme* consumer Ultrabook. In some ways, it lives up to that lofty mantle; in others, it doesn't. The notebook is attractive all right, in a brushed-metal-chassis, black-island-keyboard kind of way. We also like that the interior is free of branding, save the Beats Audio logo on the speaker grill. But if the term "Ultrabook" conjures up images of dainty thin-and-lightness, the Spectre TouchSmart XT will cure you of that. The 15.6-inch all-aluminum body looks sleek enough—and its .87-inch height is within Intel's Ultrabook specification—but its lap weight of nearly five pounds (close to six pounds with the power brick) will surprise you with its heft. At least it did us.

Nevertheless, there are advantages that conceivably offset the weight issues. The Spectre XT TouchSmart offers a relatively large display, keyboard, and touchpad, all of which impressed us with their quality. The display, framed by the slimmest of bezels, is an IPS panel with 1920x1080 resolution and a crisp, colorful picture. The keyboard seems spacious, the keys have decent travel by island-style standards, and we had no problems typing at a brisk pace. It's also backlit, natch. The glass-surface touchpad feels wonderful.

The large body also accommodates a bunch of ports, including Ethernet, HDMI, two USB 3.0, and—as proof of the Spectre's elevated status—a Thunderbolt port. Given the Spectre XT's size and weight, you might expect to find an optical drive, but it lacks that.

Under the hood, the Spectre XT TouchSmart loses some luster. Its 1.9GHz i7-3517U should give the notebook some performance chops, but in our benchmarks, the CPU never came close to its 3GHz Turbo Boost potential, producing scores that were 30 percent lower than a competing notebook with the same CPU. It was even bested by HP's own budget-minded Envy 4 (reviewed February 2013), which had a slightly lower-clocked 1.7GHz Core i5-3317U and half the RAM. We'd expect this kind of performance throttling from a more space-constrained body; or maybe HP was primarily interested in keeping fan noise at bay, because the Spectre XT TouchSmart is certainly quiet even under heavy load.

The questionable component choices continue, with primary storage handled by a 500GB 5,400rpm HDD plus a 32GB SSD cache drive. That seems a bit pedestrian for a premium product. At least the cache enables SSD-like boots and restarts, 13 and 22 seconds, respectively. Theoretically, it should also speed up the performance in commonly used programs but we didn't experience any noticeable improvement in repeated runs of CrystalDiskMark—results were consistently in line with an HDD's limits.

Battery life was also unimpressive, totaling just three hours, 20 minutes in our high-def video rundown test.

Granted, as far as "premium" notebooks go, $1,400 isn't that high a price. The fancy-schmancy Toshiba Kirabook that we reviewed last month was two grand. And like that one, the Spectre XT comes with Adobe Photoshop Elements and Premiere Elements, two years of Norton AV, and dedicated support service. But still we're left wondering how premium a notebook this is when it's kind of heavy to carry, performance is somewhat compromised, and battery life is weak. –**KATHERINE STEVENSON**

VERDICT 7

HP Spectre XT TouchSmart

+ GHOST WRITER Nice IPS screen; good keyboard and touchpad; Thunderbolt port; quiet.

– GHOST WHISPERER Heavy; constrained CPU performance; lacks full SSD storage.

$1,400, www.hp.com

BENCHMARKS

	ZERO POINT	
PCMark 8 Home	2,863	2,718 (-5.1%)
Stitch.Efx 2.0 (sec)	1,712	1,924 (-11%)
ProShow Producer (sec)	1,122	1,564 (-28.3%)
MainConcept (sec)	1,901	2,617 (-27.4%)
Quake III (fps)	358.2	354.6 (-1%)
Quake 4 (fps)	76.1	72.4 (-4.9%)
Battery Life (min)	221	200 (-9.5%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point ultraportable is an Intel reference Ultrabook with a 1.8GHz Intel Core i5-3427U, 4GB of DDR3/1600 RAM, integrated graphics, a 240GB SSD, and Windows 8 64-bit.

SPECIFICATIONS

CPU	1.9GHz i7-3517U
RAM	8GB DDR3/1600 dual channel
Display	15.6-inch 1920x1080 IPS LCD
Storage	WD 500GB HDD w/ Samsung 32GB cache SSD
Connectivity	Ethernet, HDMI, Thunderbolt, 2x USB 3.0, headphone/mic, 802.11n, Bluetooth
Lap / Carry	4 lbs, 15.7 oz / 5 lbs, 12.6 oz



The notebook's quad speakers—two up top and two underneath—get pretty loud, but even the Beats audio won't have you ditching your headphones.



The Mirror Universe version of the NZXT Kraken X60?

Corsair H110

Size isn't everything

IT SEEMS LIKE every month brings a new liquid cooler to review. Sometimes this rapid pace creates unexpected side effects. Exhibit A: The Corsair H110, which is nearly identical to the NZXT Kraken X60 reviewed on page 81 of this issue. They don't use the same fans, they don't recommend the same fan orientation, and the H110 skips software-based controls, but the rest of it appears to be the same bits manufactured by Asetek. Corsair also charges a slight price premium that we're not sure is justified.

The H110's two 14cm fans use 4-pin PWM connectors that allows them to dynamically adjust their performance as temperatures change within the case—but only if they're plugged into a 4-pin fan header. The pump uses a 3-pin connector. While this cabling is more straightforward, it does occupy three fan headers, whereas the X60 uses one. (The H110 does not come with an adapter to combine its two fan cables or a Molex adapter to plug the pump directly into your power supply.)

If your motherboard or its fan software doesn't provide separate controls for different headers, you're in an awkward spot. You don't want all your case fans spinning up and down in lockstep with the H110's fans. And you don't want the pump speed moving around a lot either; that part needs to be maxed out for full effectiveness. Since the H110's fan cables are just 12 inches long, your choices for fan headers are pretty limited, as well. The X60 uses a single 3-pin header, but it also occupies a USB header and a SATA power cable connection. Ultimately, this trade-off greatly increases compatibility, especially if your system uses multiple radiators and lots of air-cooling.

The H110's cooling isn't as problematic, since you have flexibility with radiator location and fan direction. You don't have to go with Corsair's recommendation, which is to push exterior air through the radiator and into the system. NZXT recommends that you pull air from the interior and exhaust it. We recorded temps several degrees higher than with the X60, until we flipped the H110's fan orientation to match it. Then the temps were roughly interchangeable. The scores for the H110 in the chart below are the results according to Corsair's recommended fan orientation.

Since we're using a Corsair 900D case to test coolers, we have three 12cm intake fans in the front. Therefore, the slight vacuum created by a pull orientation is easily countered. Adding two additional intake fans, which blow through a 280mm radiator and into the case, can introduce a lot of air. A single 14cm rear exhaust fan seems to struggle to keep up. We also noticed that setting up the H110 fans to exhaust created less noise.

The H110 is also up against Corsair's own H100i, a 240mm liquid cooler. Despite this other unit having less surface area than the H110's 280mm, it performs a little better and has software controls, a metal backplate (making it resistant to damage from over-tightening), and the same cable connections as the X60, for the same price or less. It also has a five-year warranty, whereas the H110 (and the X60) get two years. The H100i's smaller size and X60-like unified cabling also make it compatible with a wider variety of cases. If the H110 was priced lower, we could see it fitting into the overall ecosystem. But at $130 when this issue went to press, it's a little out of its depth.

–TOM MCNAMARA

VERDICT 8

Corsair H110

+ CHUNKY PEANUT BUTTER Solid performance with the right hardware and fan direction; uncomplicated installation.

– VEGEMITE Poor price-performance ratio; installation lacks flexibility; plastic backplate.

$130 (street), www.corsair.com

BENCHMARKS

	H110 Quiet / Performance Mode	Kraken X60 Quiet / Performance	H100i Quiet / Performance Mode	212 Evo Quiet / Performance Mode	Phanteks TC14PE Quiet / Performance Mode
Ambient Air	21.9 / 21.6	20.7 / 20.9	20.3 / 20.5	20.5 / 20	20 / 19.9
Idle Temperature	**29.3 / 28.3**	29.67 / 28.8	30.7 / 29.3	35.5 / 30.5	32 / 28.5
Load Temperature	68.6 / 65.3	**66** / 61.8	67.1 / **61**	70 / 67.3	70.3 / 68.6
Load - Ambient	46.7 / 43.7	**45.1** / 41.1	46.8 / **40.5**	49.5 / 47.3	50.3 / 48.7

All temperatures in degrees Celsius. Best scores bolded. All tests performed with an Intel Core i7-3960X at 4.1GHz, on an Asus Rampage IV Extreme motherboard, in a Corsair 900D with stock fans set to Standard.

SPECIFICATIONS

Radiator Dimensions (H x D x W)	1.06 x 12.3 x 5.45 inches
Weight	1.8 lbs
Stock Fans	2x 14cm PWM (screws included)
Socket Support	LGA1150/1155/1156/1366/2011; AM2/ AM2+/AM3/ AM3+/FM1/FM2
Additional Fan Support	2x 14cm (screws not included)



The Coenus features a nifty drive bay that converts in size.

Enermax Coenus ECA3290A-G

Great case, but what the heck is a Coenus?

IT'S EASY to dismiss Enermax's new Coenus line of computer cases the moment you lay eyes on the gunmetal-gray ECA3290A-G. It's a tiny Pomeranian of a case—only microATX and ATX motherboards need apply—and it feels every bit as flimsy to hold as its front panel and bulky top are goofy-looking.

The Coenus case might look like something you'd find warming the bargain bin at your local computer store, but its insides are far more satisfying. In fact, there's not much about this case's functionality that irks us at its $70 asking price.

Enermax wisely gives system builders easy access to the case's three screwless 5.25-inch bays via removable covers on the case's front. Popping off the front panel to access the case's preinstalled, red 12cm fan requires just a good tug from the bottom—we'd likely then move this fan to blast air over the case's three 3.5-inch bays (or install a second 12cm fan) instead of its four 2.5-inch "SSD" bays.

In fact, you might wonder why Enermax even bothers to include so much support for SSDs. Does the company really expect a typical desktop builder to max out expensive storage in a $70 case?

Maybe not: Remove two thumbscrews and you can slide back the leftmost wall of the 2.5-inch bays to convert them into extra 3.5-inch bays. We love the little trick—as much as we appreciate the handful of drive rails Enermax provides for tool-free installations—even though the conversion reduced the space between the bays and our Nvidia GTX 480 card to nearly nothing.

Thankfully, Enermax provides four holes on the motherboard tray for all your cable routing needs, including a giant cutout behind the general area of your CPU that greatly eases the process of installing an aftermarket cooler. You get around 3cm of space between the tray and the case's side panel—plenty of room to string cables hither and yon.

We're not too happy that the case's PCI brackets use standard screws instead of a stronger mechanism (or even thumbscrews) to keep your PCI devices locked into place. We also wish that the case's second included fan, its rear exhaust, wasn't so lifeless and unlit. Given the size of the window that Enermax carves into the case's side panel, we would prefer a little more fancy lighting targeting the chassis's guts.

The wires for the case's front-panel connections—two USB 3.0 ports, HD audio, and the usual wires for the power button, reset button, and power LED—come stretched nearly to the case's rear in their default configuration. Which is to say that Enermax gives you plenty to work with if you want to play with your system's cable-routing setup. Two rubberized holes on the case's rear tempt those of you looking to liquid-cool your rig, and the case itself supports a two-bay radiator on top, thanks to predrilled holes for two 12cm or 14cm fans.

You can't have everything in a sub-$100 chassis, but there's a lot to like about Enermax's design on the ECA3290A-G—so long as you don't mind the funkier accoutrements on the case's exterior.

–DAVID MURPHY

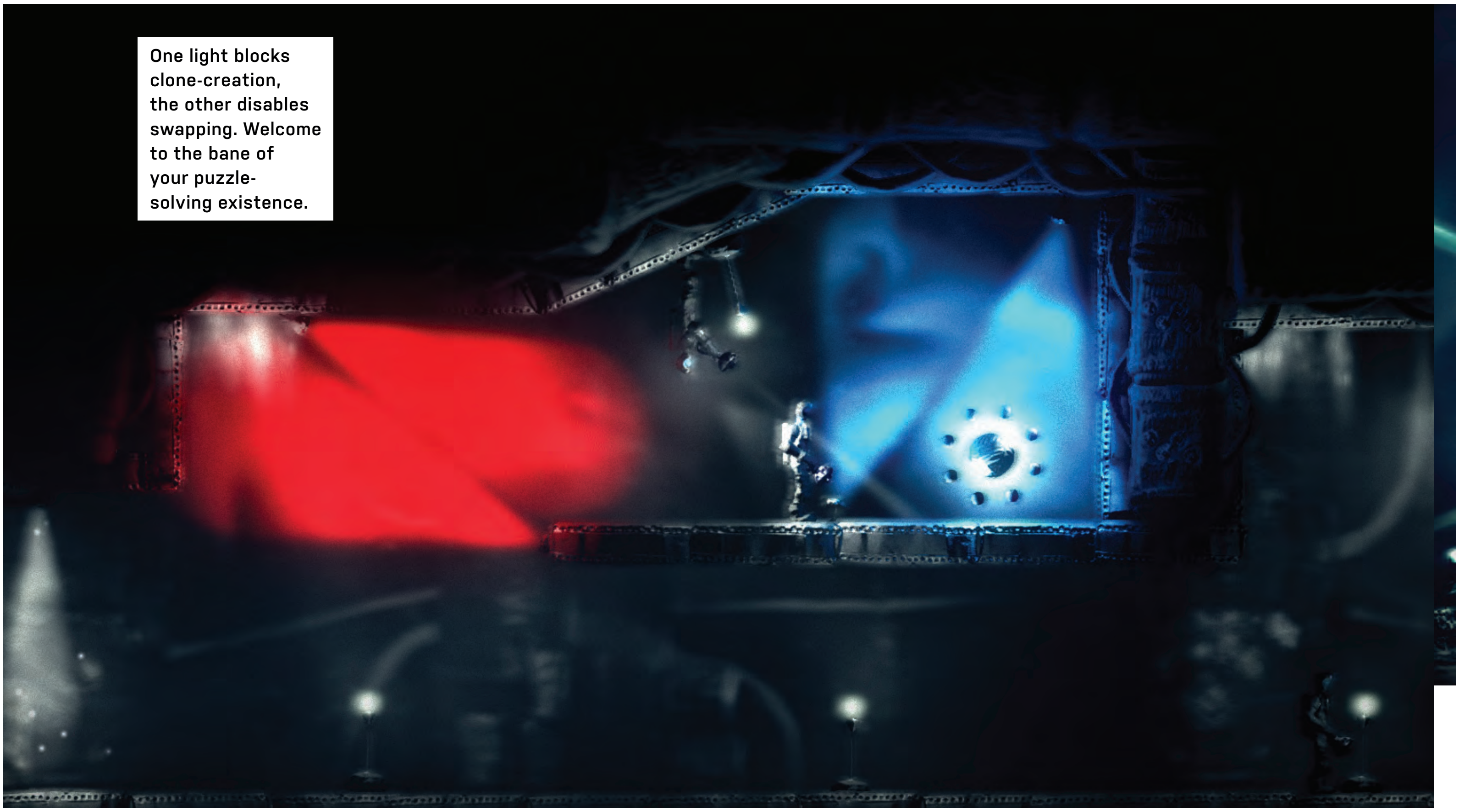
VERDICT 8

Enermax Coenus ECA3290A-G

➕ **CHUBBY BUNNY** Mostly tool-free installation; plenty of options for cable management; long front-panel connection wires.

➖ **CINNAMON CHALLENGE** Won't win any beauty contests; little space between video card and drive bays in 3.5-inch mode.

$70, www.enermaxusa.com



One light blocks clone-creation, the other disables swapping. Welcome to the bane of your puzzle-solving existence.

The Swapper

You got your puzzles in my quantum mechanics

WRITING A REVIEW OF The Swapper by Facepalm Games—a studio surely named after the gesture you'll perform when you finally solve the tougher challenges in this space-based puzzle scroller—is a bit like trying to talk about *The Prestige* to someone who's never seen the film. If that's you, it's best you just go ahead and skip this review. Our guilt would be too great if we accidentally spoiled your cinematic enjoyment.

If it sounds a little odd to be mixing movies with gaming, we counter that it would be odder still to not bring up an obvious inspiration behind The Swapper's mechanics and storyline—of which we're a bit loathe to spoil too much, given the precision behind its grand reveal.

You're not a magician in The Swapper; rather, the game starts you off as a nameless space explorer who's been (unwittingly) jettisoned from orbiting Research Station Theseus onto the surface of the planet Chori V. Once you're done basking in the loveliness of the game's cinematic opening—get used to it, because The Swapper's atmospheres only get prettier—you quickly come across the game's Portal mechanic. Enter the (appropriately named) Swapper device.

The Swapper—the gun, not the game—is a handheld version of Calvin and Hobbes's Duplicator with a fun twist. You create copies of yourself (that mirror your every move) by holding down the right mouse button, painting an outlined target of your body over a particular area, and releasing the mouse button. The "swapping" portion of the deal relates to the gun's secondary capability, which allows you to jump around between the five different copies of yourself that can simultaneously exist (if you have line-of-sight to shoot them).

In *Prestige* terms, it would be akin to Hugh Jackman's character being able to transfer his "active consciousness" from clone to clone as he sees fit, thus sparing him the unpleasant aftermath of having to drink so much water following a successful performance of his Transported Man "illusion." Of course, that explanation makes an assumption about where Jackman's core consciousness exists when the trick goes off, a fact that's hardly ignored by The Swapper's increasingly philosophical plot.

To Facepalm Games's credit, the game doesn't beat you over the head with Stephen Hawking–like displays of metaphysics—all those clones notwithstanding. The Swapper feels evenly paced as its story devolves from "simple puzzle game" to a push to discover who you are, who the game's antagonists are (if there even are any), and how a bunch of giant intelligent rocks littered around the Theseus fit into the grand picture.

Rocks, we note, that take over your



You'll be hard-pressed to find an environment in this game that isn't downright beautiful.



The Swapper seamlessly zooms in and out to give you a better sense of scale during your jaunt through the Theseus.

screen with their telepathic thoughts. Hey, we never said this game was *that* straightforward.

To borrow *Prestige* language once again, the turn eventually comes; we won't tell you when, but we will note that the game's dénouement actually does wrap up the story in a manner that's hardly displeasing. Save for, perhaps, the game's ultimate ending—you're going to feel a great compulsion to play The Swapper again. Or, at the very least, you're going to find it difficult to avoid YouTube once the credits start rolling.

We love that Facepalm Games does such a good job of easing you into its story's complexities, because the raw mechanics of this five-to-seven hour game (nine, if you're that bad at puzzles or really try to find the 10 hidden achievements) don't demand nearly as much of a leap. We're not criticizing; if anything, we think The Swapper is ideally timed for what it expects *and* delivers. We didn't feel any tedium during our puzzle-solving, unlike Portal 2's seemingly endless test levels and murky behind-the-scenes tours.

While The Swapper (mostly) confines its plot to the Theseus and uses a bit of creative backtracking to avoid trapping players in a strictly linear map progression, the game's frequent inclusion of teleportation portals allows you to travel sans headache to areas you've previously discovered. Solving the puzzles of various rooms, mostly split off from key sections by The Swapper's Super Metroid–style doors, allows you to obtain Trigon Orbs. Collect enough orbs and you unlock new sections of the ship to progress through.

Our only real criticism is that the game's setup still makes you feel like a train on a single track, as you aren't given much creative flexibility to go beyond the confines of the formula: unlock area, solve branched puzzles, unlock new area, etc. There are no bonuses in The Swapper; there are no extras. You must pick up every single orb in the game to get to the big ending, all of which makes The Swapper's framing feel a bit restricted.

The puzzles themselves follow the Portal formula: Introduce a concept, let the player master it after one or two iterations, then introduce another new concept. These can be new mechanics, like colored lights that prevent you from using the various traits of the ol' Swapper gun in critical areas, or reinvented ways of thinking—our personal favorite, given all those times we had to kill ourselves to perform simple tasks.

Yes, kill ourselves.

To bring The Swapper full circle, much of the game's core centers on the question of consciousness: Who are you? When you swap, what happens to "active you"? What happens to your soul? Do you even have a soul? Who's in the *Prestige* box?

To craft a gameplay mechanic around this very question—forcing you to constantly send an army of clones to their deaths to complete puzzles, survive falls, or, in a moment that made us cackle when we first realized it, navigate up and down through the ship—is just plain brilliant.

Facepalm Games intertwines its plot and its mechanics perfectly. By the time you've fully jumped into The Swapper's philosophical rabbit hole, you'll be killing enough copies of yourself to make an army. You might find yourself questioning your clones' fates—whether you just broke the legs of you, as your clone, or whether your clone *is* you and you just sent a useless husk of yourself on a 75-foot free-fall. You might even start to feel bad.

Absolutely beautiful visuals, excellent voice-over work (over a soothing soundtrack), and the frustrating creativity behind some of the game's puzzles make The Swapper a must-try as-is. Consider the primer on human mortality an added bonus—an extra clone, if you will.

–DAVID MURPHY

VERDICT 9

The Swapper

+ TESLA CLONING MACHINE Gorgeous visuals; lovely soundtrack; great puzzle variation; engaging storyline.

– TESLA TANK Plot and pathing more linear than branching; overused blurry effect; no method for bypassing seemingly impossible puzzles.

$15, facepalmgames.com, ESRB: Pending

LAB NOTES

GORDON MAH UNG **DEPUTY EDITOR**



Scotty, We Need Power!

Is there a limit to computing power? Yes



I'VE NEVER BELIEVED in any limit to computing power. Some genius somewhere always gives us more performance no matter what barrier some expert predicts computers will hit. This month, though, we are truly bumping into a serious power problem with high-end computing. The Dream Machine's fully kitted-out load pushed our 1,600-watt PSU to its limits and, frankly, if we had another 200 or even 300 watts, we could have pushed this year's model even further.

The problem is that the typical American home has about 15 amps at the wall. If the voltage that day is 115 volts, you're looking at 1,725 watts at the socket. That's not much headroom, and then you add your speakers, monitor, and laser printer, and suddenly you have the click-clack of a circuit breaker going off.

The good news is that the average power user is a world away from a Dream Machine, but we are truly creeping up to a real barrier that can't be easily overcome.



Jimmy Thang
Online Editor

There were a lot of console fan boys at this year's E3, and I must say that as a PC gamer, I also can't wait for the next-gen systems to come out. It will mean that multi-platform games will finally be able to give my beefy gaming rig a workout. Plus, the new Xbox One controller feels awesome and should plug into my PC nicely!



Julian Reiche
Alpha Flight Intern

As the new summer intern from Canada with zero publishing experience, my first month offered a host of new adventures. My first few weeks were spent gawking at all the ridiculously fast hardware in the office, including the Dream Machine, which I helped build (hey, someone had to hold the cables together while they were being zip-tied).



Josh Norem
Senior Editor

This month, I had fun delicately assembling the four GTX Titan Hydro Copper GPUs for the Dream Machine. You can probably guess how "exciting" it was to pump water into $5,000 worth of GPUs, knowing the fate of the entire machine depended on them not leaking. Thankfully, our fittings were as tight as our cooling chops, and even under load the GPUs never cracked 40 C.



Tom McNamara
Associate Editor

In the building of this year's Dream Machine, Gordon invented some new curse words that I can use against unsuspecting motorists and pedestrians. I also got to mess around with Corsair's 350D microATX case, which was nice because it weighs about 100 pounds less (than DM2013, not Gordon). Maybe someday I'll have time to play games or something with all this fancy hardware.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Windows 8 Love
> AMD vs. Intel
> Getting Grounded

Intel Motherboard Inquiry

While researching parts for my next Dream Build, I stumbled upon an Intel DZ79SR (Wow, matches up to a 3970X!). Why don't we hear about Intel boards more? Why is this thing so expensive? Is it worth it? Can you tell me why I don't want one?

—Webtrol

DEPUTY EDITOR GORDON MAH UNG RESPONDS: I have that board sitting under my desk. I think the reason we no longer hear about Intel boards is that excitement around them waned after Intel decided to throw in the towel on its retail motherboard business. That's right, Intel publicly announced a few months ago that it would no longer sell Intel-branded motherboards and no longer "make" them either (contract builds, actually). Intel will continue to support them via driver and UEFI updates, but most consumers don't like dead-end products unless they're had at a very good price. With that said, Intel boards have always been known for being pretty nailed-down but not as flashy as their competitors.

CUT, COPY, PASTE

On page 48 of our August Haswell feature, we referred to using an X79 board for our LGA1366 platform, but we meant LGA2011.

What Part Price?

I have a question regarding the ratings you give out. Do you take price into account? Does a decent product score higher for being inexpensive or an excellent product lower for being overpriced?

—Andrew Linder

EDITOR-IN-CHIEF KATHERINE STEVENSON RESPONDS: Our primary unit of measure is always performance, but we certainly take price into consideration. For example, a product may perform exceptionally, but if it's more expensive than products that perform comparably, we will take that into account. The same applies at the other end of the scale—a low price can excuse some performance shortcomings, but only to a point. You will never see us giving our highest recommendation to a less-than-stellar performer (for its class) by virtue of its price. Of course, there are multiple other factors that we look at, such as features, bundle, build quality, warranty, etc.—all of which go into a very nuanced mix. Ultimately, we strive to articulate the reasoning behind our review verdicts, so you can make the most informed purchasing decisions.

Now *Two* People Don't Hate Win8

I was so excited to read Gordon's July 2013 editorial. It's the first time I read the magazine, and I was delighted with his "Stop the Windows 8 Hate" column. I've been a Win8 user for about six months and started with Acceptance. Yes, I knew it wasn't going to be easy but was excited about the touchscreen and didn't want to take the road to the Apple orchard.

I was well along on the path of Denial and Confusion because everything I read suggested that this is where one should be if they even thought of using Win8. Now there's at least one believer and, while I am often in the stage of Frustration, that's OK. I'll figure it out!

—Patricia Warren

DEPUTY EDITOR GORDON MAH UNG RESPONDS: That's good to hear. I've mostly made my peace with Windows 8 and am still in the Acceptance phase, but on occasion I'll have relapses of the Anger stage, especially when I have to reboot a system. Windows 8.1 should help solve that problem, though.

Bit of Coin Knowledge Desired

Just curious, have you guys ever done or plan on doing a tutorial on Bitcoin/Altcoin mining? Would there be any legal issues in publishing something like that?

—Edward Allen Weissbard

SENIOR EDITOR JOSH NOREM RESPONDS: We've run a few news stories on the subject, Edward, but never covered it thoroughly. It's an interesting subject though, and one that deserves some attention, so stay tuned. Meanwhile, we'll be investigating how much coin those four GTX Titans in Dream Machine can crank out for us over the next few months. If you don't hear back from us, we all went on a vacation!

submit your questions to: comments@maximumpc.com

AMD vs. Intel: Fight!

What are your thoughts on AMD vs. Intel? I've used fine computers with both, I just want to know which one really is better.

—Mike Nguyen

DEPUTY EDITOR GORDON MAH UNG RESPONDS: Sorry to get political on you, Mike, but it depends on what the definition of "better" is. If you are asking if a 3.5GHz Core i7-4770K is more efficient than AMD's fastest retail consumer chip, the 4GHz FX-8350, then the Intel chip wins with its 84-watt TDP vs. the AMD's 125 watts. If you're asking which chip is faster, the Core i7-4770K will win the overwhelming majority of performance tests. If you are asking which one has more cores, the AMD part has eight cores vs. the four cores in the Intel part. If you're asking which one is cheaper, the FX-8350, at $195, is far cheaper than the Core i7-4770K at $339. If you're asking which chip gives you more PCIe lanes, Core i7-4770K or FX-8350 (and its 990FX chipset), the answer is AMD. So, it very much depends on what you mean by better, and let's not even get into the six-core chips from Intel on the LGA2011 platform. If we were to boil it down, Intel generally wins performance, power consumption, and thermals, while AMD's very aggressive prices, unlocked parts, and very stable and full-featured chipsets give it some wins. If you're buying on pure performance, you'd be wrong to choose anything other than Intel. If you're far more price sensitive, AMD has some appeal.

> "A LOW PRICE CAN EXCUSE SOME PERFORMANCE SHORTCOMINGS, BUT ONLY TO A POINT

You're Grounded

In the July issue's piece entitled "The 10 Commandments of Troubleshooting," it appears commandment five has some dogma. You state that in a pinch you can ground yourself by touching a metal file cabinet, but this could actually be worse than just diving in. The purpose of antistatic devices is to equalize the charge between you and your components, so if you carried a charge of 10 volts and the file cabinet has 20 volts, the end result would be Electrostatic Discharge ESD of five volts. Now you and the cabinet have a charge of 15 volts. If you just turned off your computer and the fans and other components have built a charge of 100 volts, when you make contact with an internal component there will be a transfer of 42.5 volts, which is deadly for solid-state circuits. The solution? Touch an unpainted portion of the case.

—Grant Gibson

SENIOR EDITOR JOSH NOREM RESPONDS: Thanks for the clarification, Grant. You are correct and we should have been more clear. Touching a painted surface will not ground you since the paint is usually an insulator and not a conductor, so be sure to touch unpainted metal before touching components.

[NOW ONLINE]

60 PICTURES THAT DEFINED E3 2013

This year's E3 was rife with people buzzing about the new consoles, but PC gaming also made a big splash, with companies like Nvidia, AMD, and Razer having extravagant booths on the show floor. To see what it was like to be at the event, check out our extensive online gallery: http://bit.ly/e3wrapup. Did we mention there were booth babes?



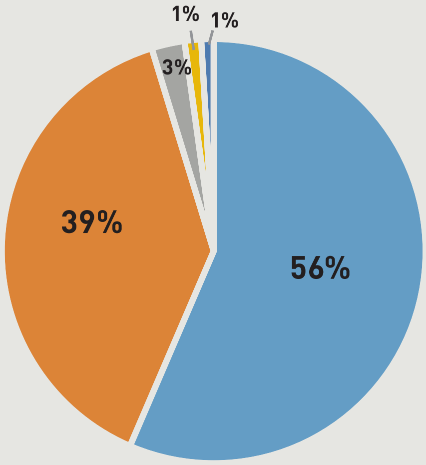
Facebook Polls

What One Program Do You Always Carry?

This month we detailed how to turn a USB key into a weaponized PC toolkit, so we asked our Facebook fans what one program they would add to the arsenal.

Christopher Evans: Malwarebytes
Jeremy Buseman: TDSSKiller
Kevin Stewart: UBCD (100 diagnostic apps)
Ryan Robb: ComboFix
Stuart Fischbach: CCleaner
Joshua Oddy: Belarc Adviser
Jacob Hinze: Sticky Password Manager
Christopher Shaine Davis: D7
Levi Bailey: Teamviewer
Greg Neumarke: Parted Magic Live with Linux
Gary Neal Gornbein: Rkill
Patrick Heath: InSSIDer
Spencer LeFevre: Ubuntu Live
Nathan Cork: CPU-Z
Alestar Lazar: Electronic copies of *Maximum PC*

What Size Is Your PC Case?



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THE BUILDS



BASELINE

INGREDIENTS

PART		PRICE
Case	Corsair Carbide 200R	$50
PSU	Corsair CX500M 500W **NEW**	$35
Mobo	Gigabyte GA-Z87-UD3H	$180
CPU	Intel Core i5-4670K	$235
Cooler	Cooler Master Hyper 212 Evo	$32
GPU	Sapphire Radeon HD 7950 11196-19-20G **NEW**	$275
RAM	8GB Corsair Vengeance DDR3/1600	$60
Optical Drive	LG GH24NS95 DVD Writer	$16
SSD	SanDisk Extreme 120GB **NEW**	$94
HDD	Seagate Barracuda 1TB	$70
OS	Windows 8 64-bit OEM	$88

Approximate Price: $1,135

DON'T CONFUSE "BASELINE" with "underpowered," as the Intel Core i5-4670K hauls ass and the rest of this rig is plenty powerful. This month, we upgraded the video card from an AMD Radeon HD 7870 GHz Edition to the Radeon HD 7950, since the 7950 also has more horsepower and an additional gigabyte of video RAM, which is handy for high-res textures and long draw distances. To get there, we downgraded the PSU and SSD, going from a 720W Cooler Master to a 500W Corsair, and a Samsung 840 Pro to the SanDisk Extreme. The new SSD is plenty snappy and 500 watts is sufficient for a system with a single GPU. We're also retaining last month's transition to the OEM version of Windows 8.



PERFORMANCE

INGREDIENTS

PART		PRICE
Case	NZXT Phantom 630	$130
PSU	Corsair HX850 **NEW**	$133
Mobo	Asus Sabertooth X79	$325
CPU	Intel Core i7-3820	$290
Cooler	NZXT Kraken X40	$95
GPU	EVGA GeForce GTX 780 ACX	$660
RAM	4x4GB Corsair Vengeance DDR3/1600	$120
Optical Drive	Asus BW-12B1ST	$60
SSD	256GB Samsung 840 Pro **NEW**	$220
HDD	Seagate Barracuda 3TB	$135
OS	Windows 8 64-bit OEM	$88

Approximate Price: $2,180

MOST OF THE PARTS previously selected for this tier still deliver great performance for the price, so not much has changed this month. Corsair had a deal on its HX850 power supply though, so we took advantage of that. It has superb build quality and a long seven-year warranty. Also this month, the 256GB Samsung 840 Pro was about the same price as the 240GB Neutron GTX we had in here previously, so we swapped them since the 840 Pro is a bit faster. As with the Baseline system, we're sticking to Windows 8. These are the OEM versions, which means that the activation code is tied to the motherboard. The trade-off is that it costs much less than the "full" version.



ULTRA

AFTER SEEING TWO Nvidia GeForce GTX 780s work their SLI magic in Build It (page 68), we were compelled to put them in the Ultra system, which had a single GTX Titan in it last month. The GTX 780 is basically a gaming-oriented version of the Titan, with two SMX units and double-precision compute removed. When over-clocked, a GTX 780's gaming performance comes within spitting distance of its big brother, so two of them are truly a dream come true. This motherboard and power supply will also handle a third 780 without breaking a sweat.

The BEFX power supply is one of the best in its class and comes from Seasonic. Since it's fully modular, you can replace all the cables if they get damaged or if you want to make cosmetic changes, and it makes for less clutter, too. Its fan also uses a "hybrid mode" setting, where it doesn't even spin up when the system is idle, ensuring quiet operation when you're just surfing around or watching videos. The overall build quality is reportedly a bit better than the Cooler Master Silent Pro unit it replaces.

INGREDIENTS

PART		PRICE
Case	Corsair 900D	$350
PSU	XFX ProSeries 1250W P1-1250-BEFX **NEW**	$200
Mobo	Asus P9X79 Deluxe	$375
CPU	Intel Core i7-3930K	$550
Cooler	Corsair H100i	$100
GPU	2x EVGA Nvidia GeForce GTX 780 **NEW**	$1,320
RAM	4x4GB Corsair Vengeance DDR3/1600	$120
Optical Drive	Asus BC-12B1ST BD-R Burner	$60
SSD	Samsung 840 Pro 512GB	$440
HDD	Seagate Barracuda 3TB	$120
OS	Windows 8 Professional 64-bit OEM	$140

Approximate Price: $3,775

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

UPGRADE OF THE MONTH
NVIDIA GEFORCE GTX 780



If you liked the GeForce GTX Titan but were put off by its $1,000 price tag, Nvidia has answered your prayers with the GTX 780. It's basically a GTX Titan with half the RAM, no double-precision compute, but 95 percent of the gaming horsepower, for $350 less. Two thumbs up!
$650, www.nvidia.com

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